

AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

ADVISORY EDITORIAL BOARD

FRIED L. ADAIR
CHANNING W. BARRETT
C. L. BONIFIELD
W. W. CHIPMAN
H. S. CROSSEN
THOMAS CULLEN
ARTHUR H. CURTIS
EDWARD P. DAVIS
JAMES E. DAVIS
J. B. DELEE
ROBERT L. DICKINSON

PALMER FINDLEY
ROBERT T. FRANK
GEORGE GELLHORN
WILLIAM P. GRAVES
HERMAN E. HAYD
BARTON C. HIRST
E. J. ILL
FLOYD E. KEENE
J. C. LITZENBERG
F. W. LYNCH

FRANKLIN H. MARTIN
C. JEFF MILLER
HENRY P. NEWMAN
GEO. H. NOBLE
REUBEN PETERSON
JOHN A. SAMPSON
F. F. SIMPSON
HENRY SCHWARZ
HOWARD C. TAYLOR
GEORGE GRAY WARD
B. P. WATSON

OFFICIAL ORGAN OF

THE AMERICAN GYNECOLOGICAL SOCIETY

THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS AND ABDOMINAL SURGEONS;
NEW YORK OBSTETRICAL SOCIETY; OBSTETRICAL SOCIETY OF PHILADELPHIA; BROOKLYN
GYNECOLOGICAL SOCIETY; ST. LOUIS GYNECOLOGICAL SOCIETY; NEW ORLEANS GYNECOLOGICAL
AND OBSTETRICAL SOCIETY; BALTIMORE OBSTETRICAL AND GYNECOLOGICAL SOCIETY; CHICAGO
GYNECOLOGICAL SOCIETY; CENTRAL ASSOCIATION OF OBSTETRICIANS AND GYNECOLOGISTS
OBSTETRICAL SOCIETY OF BOSTON.

Editor. . . . GEORGE W. KOSMAK
Associate Editor. . HUGO EHRENFEST

VOLUME XXII
JULY—DECEMBER, 1931

ST. LOUIS
THE C. V. MOSBY COMPANY

1931

COPYRIGHT, 1931, BY THE C. V. MOSBY COMPANY

(All Rights Reserved)

(Printed in U. S. A.)

*Press of
The C. V. Mosby Company
St. Louis*

American Journal of Obstetrics and Gynecology

VOL. XXII

ST. LOUIS, JULY, 1931

No. 1

Original Communications

PROBABLE TUBAL ORIGIN OF ENDOMETRIOSIS

By H. S. EVERETT, M.D., BALTIMORE, MD.

(From the Department of Gynecology of the Johns Hopkins Hospital and University)

ON APRIL 4, 1898, W. W. Russell reported to the Johns Hopkins Hospital Medical Society a case of aberrant portions of the müllerian duct found in an ovary.¹ He described definite areas of endometrium with both glands and stroma situated in the substance of the right ovary removed from a woman in whom the left ovary was the site of a cystic adenocarcinoma. He further stated that some of the epithelial cells were ciliated and went with considerable detail into the embryology of the female genital tract, attributing the origin of this uterine mucosa in the ovary to aberrant portions of the müllerian ducts.

This communication did not appear until March, 1899, and meanwhile Von Franke² had published in July, 1898, a brief preliminary report of a similar case, but so far as I have been able to ascertain, Russell's report to the Johns Hopkins Medical Society was the first public presentation of a case of what today is widely known as endometrial cysts of the ovary.

In 1919 Casler³ reported a case in which after panhysterectomy for diffuse myomatous enlargement of the uterus the patient continued to menstruate through the vaginal vault. Examination of the removed uterus had shown the musculature penetrated everywhere by endometrial stroma but without glands. Three and a half years later the remaining ovary began to enlarge, and when removed four years after the original operation, was found to contain, in addition to normal ovarian elements, large quantities of typical endometrial tissue.

These three cases afford the only instances of endometrial or müllerian

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

lerian tissue in the ovary to be found in the literature prior to 1921, and this notwithstanding the fact that during the period since Russell's original communication a very extensive literature had grown up around the subject of aberrant endometrial tissue, largely as a result of Cullen's exhaustive and prolific work on the subject of adenomyoma. The essential results of this work are summarized in his two papers on "The Distribution of Adenomyomata Containing Uterine Mucosa," published in 1919 and 1920 respectively.^{4, 5}

In 1921, however, the presence of endometrial tissue in the ovary was still considered a great rarity, as is made evident by the fact that Charles C. Norris,⁶ of Philadelphia, reported a single case which he considered very remarkable. He attempted to explain the finding upon an embryologic basis. The next year James C. Janney,⁷ of Boston, in an article entitled "Report of Three Cases of a Rare Ovarian Anomaly," described three cases of his own and collected from the literature the four others already mentioned. He also believed the condition to be very rare and considered aberrant embryologic rests of müllerian tissue as a source of origin of such misplaced endometrium.

Already in September, 1921, however, John H. Sampson,⁸ of Albany, had reported a series of 23 cases of "Perforating Hemorrhagic (Chocolate) Cysts of the Ovary" which he showed to be lined by tissue of müllerian or endometrial nature. He described in detail the pathologic and clinical aspects of these hemorrhagic ovarian cysts and also the associated pelvic adhesions containing endometrial tissue which he termed endometriosis. He believed that the areas of endometrium found in the pelvic adhesions were implants from epithelium escaping from perforating endometrial cysts of the ovary, but he made no attempt, in this first communication, to explain the origin of the endometrial tissue in the ovary.

Since his first paper in 1921, Sampson has kept the subject of endometriosis constantly before the profession, so that in gynecologic circles it has become one of the most extensively discussed subjects of the day. In May, 1922, he read before the American Gynecological Society a paper called "The Life History of Ovarian Hematomas (Hemorrhagic Cysts) of Endometrial (Müllerian) Type."⁹ At this time he reported 37 cases collected during the year May 1, 1921, to May 1, 1922. From the study of these cases he developed the theory that endometrial cysts of the ovary and pelvic endometriosis arise from implants derived "through or from" the fallopian tube. He further concluded that they may arise from either tubal or uterine epithelium, and histologically may be divided into three groups. First, those in which the characteristic uterine stroma is lacking and the picture is that of glands or tubules lined by ciliated epithelium, and in which the structure resembles that of the mucosa of a primary adenomyoma

of the tube, strongly suggesting that the implantations might have been derived from the epithelium of the fallopian tube. In the second group he put those in which there are both stroma and glands similar to normal endometrium, and in this group he states that the histologic picture strongly suggests that these adenomas were derived from uterine epithelium escaping through the lumen of the fallopian tube, or, in other words, from menstruation with a back-flow into the peritoneal cavity, or from portions of tubal mucosa which had reacted to menstruation. In the third group he placed those cases in which the picture suggested a mixture of adenomas of tubal and uterine type, or represented transitional stages from one to the other.

Thus Sampson early in his work on the subject was of the opinion that either endometrium or tubal mucosa might give rise to so-called endometriosis, and from the definition of his third group it would seem that he also considered the possibility that there might be a metaplasia of one of these types of epithelium into the other. The idea of retrograde menstruation, however, seems to have been the phase of the subject which has attracted the most widespread attention, and even Sampson in his later papers, although casually mentioning the possibility of a tubal origin from time to time, laid very little stress upon it, so that it was largely lost sight of until May, 1928, when he again presented the idea before the American Gynecological Society in a paper called "Endometriosis Following Salpingectomy."¹⁰

In this communication he presented a series of 30 cases of endometriosis arising from the tubal stumps and invading the surrounding tissues, collected from a series of 36 cases studied in which a previous salpingectomy or tubal sterilization had been performed. This subject interested me for two reasons: first, because I believed at the time that I had frequently seen pictures similar to those which Sampson described in uterine cornua and the walls of the isthmie portions of tubes from cases in which the tubes and cornua had been subjected to no previous operative manipulation.* In the second place, the possibility of ovarian and pelvic endometriosis arising from the transplantation and metaplasia of tubal epithelium, it seems to me, is a subject deserving more careful consideration than it has hitherto been given. It is with these ideas in mind that I have undertaken the following study.

I. ADENOMATOUS INVASION OF THE UTERINE CORNU AND TUBAL ISTHMUS IN CASES NOT THE SUBJECT OF PREVIOUS PELVIC OPERATIONS

During the year July 1, 1927, to July 1, 1928, I obtained sections from the isthmie portions of the tubes or from the uterine cornua from

*Cullen, in 1893, instituted the habit in our laboratory of obtaining sections from the cornua of all uteri removed, so that at the time I heard Sampson's paper, although I had made no careful study of the subject, I had casually observed a considerable number of such sections.

122 cases in which no previous operation had been performed upon the tubes. In the majority of these the uterus was removed, usually together with the tubes, for leiomyoma or other uterine pathologic conditions. In a small number (22) of the cases, however, the uterus was not removed but sections were obtained from the wedge of cornual tissue excised with the tube, which is the usual method of salpingectomy in our clinic. To secure uniformity the sections were taken in both types of cases from blocks just proximal to the cornual isthmic junction and thus containing the most distal part of the interstitial portion of the tube. This location further serves to meet the objection raised by Sampson, in the discussion of his paper before the American Gynecological Society in 1928, that the condition which he was describing was not to be confused with the usual conception of adenomyoma of the uterine cornu, which he claimed was located more deeply. The location which I have chosen for my sections I believe corresponds very closely to that from which his sections were taken for the study of tubal stumps. In some of my cases I also have sections from the isthmic portions of the tubes.

The study of these 122 cases reveals that in 37 of them, or approximately 30 per cent, the musculature of this region was invaded by more or less numerous tubules or gland-like spaces lined by columnar epithelium, a picture exactly analogous to that described by Sampson in his 30 cases following operative trauma of the tubal isthmus.* The only difference noted between my cases and those of Sampson is that in his cases there was often an extension of the process beyond the tissues of the uterine cornu and tubal isthmus into whatever tissues might be, as a result of the previous operative procedure, adjacent to these structures.

This leads, then, to my first point, which is that an operative trauma with a transplantation is not necessary for the production of aberrant adenomatous growths of uterine or tubal epithelium in the region of the uterine cornu. On the contrary, such growths are frequently present where the specimen has been subjected to no previous operative procedure, but in my experience are usually limited in extent by the peritoneal covering of the uterus and tube, though often approaching this covering very closely. The operative resection of the tube in such cases may very well, as Sampson has claimed, give rise to transplantation of bits of epithelium, thus resulting in an adenomatous process; but, on the other hand, it certainly breaks the continuity of the protective peritoneal covering and may thus give rise to a further advance of an adenomatous process already present.

*In a recent personal communication Sampson has suggested that the basis for reckoning percentages should be cornua rather than uteri, and in a series of cases not previously operated upon studied from this point of view he found a considerably lower percentage of glandular patterns than I have. In re-estimating my cases according to his suggestion, however, I find 31 per cent of glandular patterns or a slight increase over the percentage when calculated for uteri.

A careful study of the more minute histologic structure of these adenomatous formations is of considerable interest. The results of such a study are recorded in Table I. It will be seen by reference to this table that in 29 of the 37 cases the tubules or gland-like spaces were lined by characteristic tubal epithelium. This epithelium, as has been shown by Novak and myself,¹¹ is quite characteristic, and is distinguished by at least two types of cells; one large, clearly staining, ciliated, and nonsecretory; the other narrow, deeply staining, non-ciliated, and secretory. This is quite a distinct picture from that of the epithelium lining the endometrial glands which is composed of a single layer of columnar cells, uniform in type, all secretory at certain stages of the menstrual cycle, and nonciliated. The last statement is contrary to the accepted views which describe the uterine epithelium as ciliated, but the above authors in the study of numerous specimens, both by stained sections and fresh tissue preparations, similar to those used in the demonstration of cilia in tubal epithelium, have been unable to detect any evidence of ciliation of the cells lining the uterine glands, except in an occasional case of endometrial hyperplasia. Cilia, however, are usually present on some of the cells of the surface epithelium of the endometrium, but there is no evidence here of two distinct types of cells as in the tube.

In 4 of the other 8 cases, the tubules or gland-like spaces were typical endometrial glands lined by unmistakable endometrial epithelium, while in 4 others some of the spaces were lined by uterine and others by tubal epithelium. All of these 8 cases showed definite endometrial stroma surrounding the gland-like spaces, and in two of the 29 cases with only the tubal type of epithelium there was a loose cellular tissue surrounding the tubules, strongly suggestive of endometrial stroma.

The last 6 cases mentioned are to my mind most suggestive of certain possibilities. The simultaneous presence of aberrant epithelial tissue of both uterine and tubal nature, in a situation more closely approximated to the normal tubal lumen than to the uterine cavity, and where aberrant tubal epithelium alone is commonly found, strongly suggests the possibility of a metaplasia of tubal epithelium into endometrium. The presence of gland-like spaces lined by tubal epithelium but surrounded by endometrial stroma is even more convincing of the possibility of such a transition. These cases seem to me so important in the argument that a more detailed description of the individual cases seems worth while.

CASE 5.—Gyn. Path. No. 32562. E. M., aged twenty-seven, white. L.M.P.* July 22, 1927.

Operation.—Aug. 15, 1927, left salpingo-oöphorectomy; right salpingectomy; appendectomy.

*L.M.P. = last menstrual period.

TABLE I

NUMBER	AGE	RACE	OPERATION	PATHOLOGIC DIAGNOSIS	SECTIONS OF CORNU	SECTIONS OF ISTHUS	ENDOMETRIAL STROMA	TYPE OF EPITHELIUM	E = ENDOMETRIAL T = TUBAL	REMARKS
1	40	C	Supravaginal hysteromyectomy, appendectomy	Myomas of the uterus, interstitial; endometritis, subacute; chorionic villi and degenerated fetal tissue in uterine cavity	One	0	+		E	Tubes normal clinically
2	21	C	Parovarian cystectomy, salpingectomy, appendectomy	Parovarian cyst; tube normal	Left	0	0		T	Section from resected wedge of cornu
3	20	C	Left salpingo-oophorectomy	Salpingitis, chronic, left; tubal pregnancy ruptured, left, infected; normal ovary.	One	0	0		T?	Section from resected wedge of cornu; chronic inflammatory reaction distorting epithelium
4	44	W	Hysteromyectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myoma of the uterus; endometritis, chronic; salpingitis, chronic; T-O abscess, left; peri-oophoritis, chronic, right	Both	0	0		T	Interstitial portion of one tube lined by endometrium
5	27	W	Left salpingo-oophorectomy, right salpingectomy, appendectomy	Perisalpingitis, chronic bilateral; peri-oophoritis, chronic, left; adenomyoma of uterine cornu	Both	0	+		T and E	Sections from resected wedges of uterine cornu; endometrial stroma with glands, some lined by tubal, others by endometrial epithelium
6	40	W	Hysterectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Interval endometrium with endometrial polyps and tendency to hyperplasia and adenomyoma; salpingitis and peri-oophoritis, chronic, bilateral	Both	0	?		T	Epithelium definitely tubal; some of the glands surrounded by a questionable stroma

			Both	0	0	T	One side only shows gland-like spaces lined by tubal epithelium
7 47 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; endometritis, chronic; interval endometrium; one tube normal; one tube, mild chronic salpingitis; corpus luteum hematoma, right ovary; follicular cysts, left ovary	Both	0	0	T	One side only shows gland-like spaces lined by tubal epithelium
8 36 C	Hysteromyomectomy (supravaginal), right salpingo-oophorectomy, appendectomy	Myomas of the uterus; interval endometrium; salpingitis, subacute, right; peri-oophoritis, chronic, right, with follicular cysts	One	0	0	T	Ovary contains spaces lined by tubal epithelium
9 29 C	Hysterectomy (supravaginal), left salpingo-oophorectomy, excision of scar	Salpingitis and peri-oophoritis, chronic, left; endometrial polyps, postmenstrual endometri-um; simple cyst of left ovary lined by tubal epithelium with hemorrhage in surrounding tissues	Both	0	+	E	Only one cornu shows adenomyoma; other normal
10 56 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; senile endometrium; salpingitis, chronic, obliterative, bilateral; senile ovaries with areas of calcification	One	0	0	T?	Epithelium so flattened by cystic dilatation of glands that its type cannot be definitely distinguished
11 47 C	Hysteromyomectomy (supravaginal), appendectomy	Myomas of the uterus; late interval endometrium; adenomyoma of uterus, slight; adenomyoma of uterine cornu (?); adnexa normal (Cl.)	One	0	0	T	Definite adenomyoma situated more deeply than region under consideration; this shows tubal-lined spaces
12 36 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; premenstrual endometrium; salpingitis and peri-oophoritis, chronic, bilateral	One	Both	0	T	Tubal walls much scarred everywhere; contain gland-like spaces lined by tubal epithelium
13 42 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; salpingitis, chronic, bilateral, old; corpus luteum hematoma, left ovary	Right	0	0	T	Right lumen (interstitial portion) lined by endometrium; left cornu distorted by myoma; specimen removed during menstruation

TABLE I—CONT'D

NUMBER	AGE	RACE	OPERATION	PATHOLOGIC DIAGNOSIS	SECTIONS OF CORNU	SECTIONS OF ISTHMI	ENDOMETRIAL STROMA	TYPE OF EPITHELIUM	T	REMARKS
14	31	C	Panhysterectomy, bilateral salpingo-oophorectomy	Epidermoid carcinoma of cervix uteri; normal corpus uteri with interval endometrium; normal tubes and ovaries	Both	Both	+	?	T	No salpingitis, so this cannot be used as an explanation of gland-like spaces in cornua
15	45	C	Hysteromyomectomy (supravaginal), bilateral salpingectomy, left oophorectomy, right oophorocystectomy, appendectomy	Myomas of the uterus; atrophic endometrium with retention cysts; salpingitis, chronic, bilateral; papillary cystadenoma, left ovary; atrophic right ovary	0	One	0		T	Not a representative case
16	38	C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; salpingitis, chronic, bilateral with chronic pyosalpinx, right; corpus luteum and follicular cysts of right ovary	One	Both	0		T	Cornu normal; gland-like space in both isthmi
17	38	C	Hysteromyomectomy (supravaginal), left salpingo-oophorectomy, appendectomy	Myomas of the uterus; fibrous degeneration of endometrium; normal tube and ovary, left	0	Left	0		T	Salpingitis, isthmica, nodosa, chronic, mild
18	25	C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; premenstrual endometrium; salpingitis, chronic, bilateral; adenomyoma of tubes and cornu; normal ovaries with small cysts in periphery lined by tubal epithelium	Both	Both	+		T and E	Transitional case; see complete description
19	39	C	Hysteromyomectomy (supravaginal), left salpingo-oophorectomy, appendectomy	Myomas of the uterus; late menstrual endometrium; salpingitis chronic left; corpus luteum cyst of left ovary	Left	0	0		T	Ovary contains inclusions of tubal epithelium, cystic

			Both	0	T	Only slight scarring of left anipulla
20 29 C	Hysteromyomectomy (supravaginal), left salpingo-oophorectomy	Myomas of the uterus; late interval endometrium; salpingitis, chronic, left, mild; corpus luteum hematoma, left	Both	0	0	
21 33 C	Panhysterectomy, bilateral salpingectomy	Myomas of the uterus, interstitial, small; endocervicitis, chronic; adenomyoma of uterine cornu; salpingitis, chronic, bilateral, mild	Both	0	0	T
22 44 C	Hysteromyomectomy (supravaginal), appendectomy	Myomas of the uterus; endometrial polyps; cystic endometritis	One	0	0	T
23 41 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; endometritis, chronic, mild; salpingitis, chronic, bilateral, mild; normal ovaries	Both	0	0	T
24 35 C	Panhysterectomy, bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus, submucous; interval endometrium; salpingitis, chronic follicular, bilateral; atrophic right ovary; atretic follicles, left ovary	One	0	0	T
25 53 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; senile endometrium; small follicular cyst of left ovary; tubes and ovaries otherwise normal	Both	0	+	T and E
26 32 C	Hysteromyomectomy (supravaginal), bilateral salpingo-oophorectomy, appendectomy	Myomas of the uterus; follicular hydrosalpinx, bilateral; follicular cysts of ovaries, bilateral; adenomyoma of uterine cornu, left	Both	0	0	T
27 23 C	Bilateral salpingectomy, appendectomy	Salpingitis, chronic, bilateral; salpingitis, isthmica nodosa, acute bilateral	Both	0	0	T

A bit of endometrium with stroma and glands found adherent to posterior surface of uterus
Gland-like spaces in ovary lined by tubal epithelium

Interstitial portion of tubal lumen lined by endometrium

Adenomatous picture in left cornu; lumen of interstitial portion of right tube lined by endometrium

Sections from wedges resected from cornua show infiltration of polymorphonuclear leucocytes

TABLE I—CONT'D

NUMBER	AGE	RACE	OPERATION	PATHOLOGIC DIAGNOSIS	SECTIONS OF FOUNT	SECTIONS OF ISTHMUS	ENDOMETRIAL STROMA	TYPE OF EPITHELIUM	T = TUBAL E = ENDOMETRIAL	REMARKS
28	40	C	Hysteromyomectomy (supra-vaginal), bilateral salpingo-oophorectomy	Myomas of the uterus; adenomyoma of uterine cornu; interval endometrium; follicular hydro-salpinx bilateral; atretic ovaries	Both	0	+	E and T	E = ENDOMETRIAL T = TUBAL	
29	28	C	Bilateral salpingectomy, appendectomy	Salpingitis, chronic, bilateral; salpingitis isthmica nodosa	0	Both	0	T		Sections from uterine ends of tubes
30	29	C	Panhysterectomy, bilateral salpingo-oophorectomy, appendectomy	Endometritis chronic; partially bicornuate uterus with rudimentary right horn; salpingitis, chronic, old; follicular cysts of ovaries	Both	Both	0	T		Sections from cornual isthmie junctions; tubal inclusions in ovaries
31	34	C	Hysteromyomectomy (supra-vaginal), salpingo-oophorectomy, right	Myomas of the uterus; interval endometrium; adenomyoma of uterine cornu, right; tube normal, right; follicular hematoma, left	Right	0	+	E		
32	29	C	Hysteromyomectomy (supra-vaginal), right salpingo-oophorectomy, left salpingectomy	Myomas of the uterus; premenstrual endometrium; salpingitis, chronic follicular, right; hydro-salpinx, left; atresia folliculi, right ovary	Right	0	0	T		
33	34	W	Hysteromyomectomy (supra-vaginal), partial resection of left ovary, appendectomy	Myomas of the uterus; endometrial polyps; interval endometrium; adenomyoma of uterine cornu, left	Both	0	+	E		Adenomyoma uterine cornu, left side only; right side shows double tubal lumen in interstitial portion

				Both	0	0	T
34	50	C	Hysteromyectomy (supra-vaginal), right salpingo-oophorectomy, left salpingectomy, appendectomy	Myomas of the uterus; endometrial hyperplasia (localized); hydrosalpinx, bilateral, calcified ovary, right.			
35	43	W	Hysteromyectomy (supra-vaginal), appendectomy	Myomas of the uterus; adenomyoma of uterine cornu, left	Left	0	T
36	21	C	Right salpingo-oophorectomy, left salpingectomy, appendectomy	Salpingitis, chronic and subacute, right; hydrosalpinx, left; corpus luteum cyst and hematoma of right ovary	One	0	T
37	35	C	Hysteromyectomy (supra-vaginal), left salpingo-oophorectomy, right salpingectomy, appendectomy	Myomas of the uterus; menstruating endometrium; adenomyoma of uterine cornu of tubal type; follicular hydrosalpinx, bilateral; oophoritis, chronic, left	Both	0	0
							Adnexa normal clinically
							Section from wedge excised from cornu
							Gland-like spaces embedded in definite myomatous thickening; loose fragment of endometrium in one lumen

Pathologic Diagnosis.—Perisalpingitis, chronic, bilateral; perioöphoritis, chronic, left; appendicitis, chronic; adenomyoma of uterine cornua.

Description.—The tubes and left ovary are covered with adhesions but the endosalpinx in the ampullary portions of the tubes is essentially normal. In the substance of the ovary are several small spaces lined by tubal epithelium. Sections



Fig. 1.—Gyn. Path. No. 32562. Photomicrograph ($\times 10$) of a section through the wedge of cornual tissue removed with the tube in performing a salpingectomy. Cross-section of the tubal lumen is seen at *l*, divided into two portions by a mucosal septum. Scattered throughout the myometrium between the lumen and the serosal surface are numerous glandlike spaces lined by epithelium.

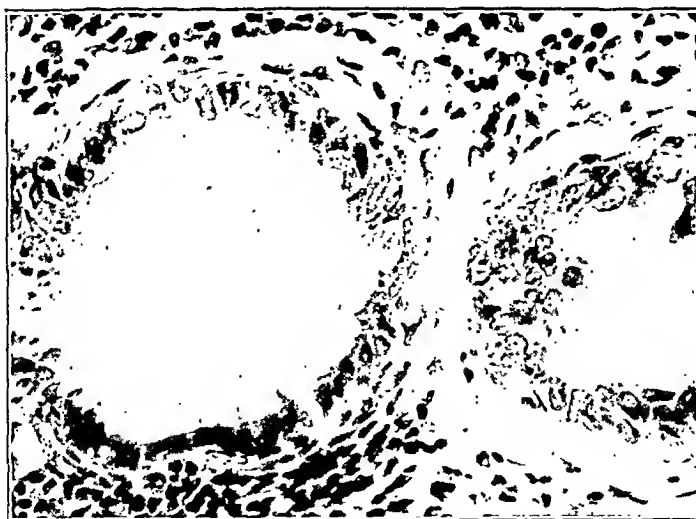


Fig. 2.—Gyn. Path. No. 32562. Photomicrograph ($\times 660$) of another area from same section as Fig. 1. The epithelium here is tubal in type (the cilia can be clearly seen in the more centrally placed gland) but around the glands is a loose cellular stroma resembling that of endometrium.

taken from the wedges resected from the uterine cornua during removal of the tubes show the same condition on both sides (Fig. 1). The interstitial portion of the tube is definitely demarcated by the circular and longitudinal layers of smooth muscle fibers which are quite distinct from the surrounding myometrium. The

lumen is lined by typical tubal epithelium and is divided into two portions by a mucosal septum stretching across it. In the surrounding myometrium are numerous gland-like spaces, some of which are lined by tubal epithelium and are not surrounded by any suggestion of endometrial stroma. Other similar spaces are also lined by tubal epithelium but are surrounded by definite endometrial stroma (Fig. 2), while still others are surrounded by stroma and are also lined by typical uterine epithelium.

CASE 6.—No. 32579. B. G., aged forty, white. L.M.P., Aug. 7, 1927.

Operation.—Aug. 20, 1927, posterior colporrhaphy; supravaginal hysterectomy; bilateral salpingo-oöphorectomy; appendectomy.

Pathologic Diagnosis.—Interval endometrium with endometrial polyps and tendency to hyperplasia and adenomyoma; salpingitis, chronic, bilateral; perioöphoritis, chronic, bilateral; appendicitis, chronic.

Description.—Sections from both uterine cornua taken near the cornual-isthmic junction show similar pictures. The tubal lumen is small, slit-like, and lined by tubal epithelium. In the myometrium are many gland-like spaces lined by columnar epithelium, which by the presence of both ciliated and non-ciliated cells is easily recognized as tubal in type. Some of the spaces, however, are somewhat dilated and in these the epithelium is so flattened that its normal characteristics are not easily distinguished. Several of the spaces are surrounded by a loose connective tissue with many round cells. This may be merely a lymphoid infiltration, but it strongly suggests endometrial stroma. Some of the gland-like spaces are very near the serosal surface, and most of them are situated between the normal tubal lumen and the serosal surface rather than more deeply.

CASE 14.—No. 32786. C. E., aged thirty-one, colored. L.M.P., doubtful.

Operation.—Nov. 7, 1927, panhysterectomy; bilateral salpingo-oöphorectomy.

Pathologic Diagnosis.—Epidermoid carcinoma of cervix uteri; normal corpus uteri with interval endometrium; numerous gland-like spaces lined by tubal mucosa in both uterine cornua; tubes and ovaries normal.

Description.—Sections are taken from the cornual-isthmic junction on both sides. In one of these the lumen is greatly dilated and the epithelium much flattened. Surrounding the lumen, however, are numerous glands-like spaces all lined by tubal epithelium and some of these are surrounded by a thin layer of stroma very suggestive of endometrial stroma. In the section from the other side the lumen is small and there are also numerous gland-like spaces. These are all lined by epithelium which is definitely tubal in type and there is no suggestion of stroma. There are in this section, however, a few small foci of round cell infiltration.

CASE 18.—No. 32914. J. K., aged twenty-five, colored. L.M.P., Nov. 22, 1927.

Operation.—Dec. 15, 1927, supravaginal hysteromyomectomy; bilateral salpingo-oöphorectomy; appendectomy.

Pathologic Diagnosis.—Myomas of the uterus, interstitial and subserous; premenstrual endometrium; salpingitis, chronic, bilateral; adenomyoma of tube and uterine cornu, unilateral; ovaries normal; appendicitis, chronic.

Description.—In the uterine cornu on one side and the isthmus and ampulla of the tube on the same side, there is no distinct normal lumen but there is a greatly increased amount of fibromuscular tissue. In the cornu are many gland-like spaces lined by tubal epithelium and some of these are surrounded by definite endometrial stroma (Fig. 3). Near by are other areas of definite endometrium showing both stroma and glands. In the isthmus and ampulla the epithelium is all tubal in type, but there is an abundance of typical endometrial stroma surrounding the gland-like spaces (Figs. 4, 5, and 6).

The other cornu and isthmus show no adenomatous formation, but the ampulla on this side shows an old salpingitis with much scarring. The ovaries appear normal

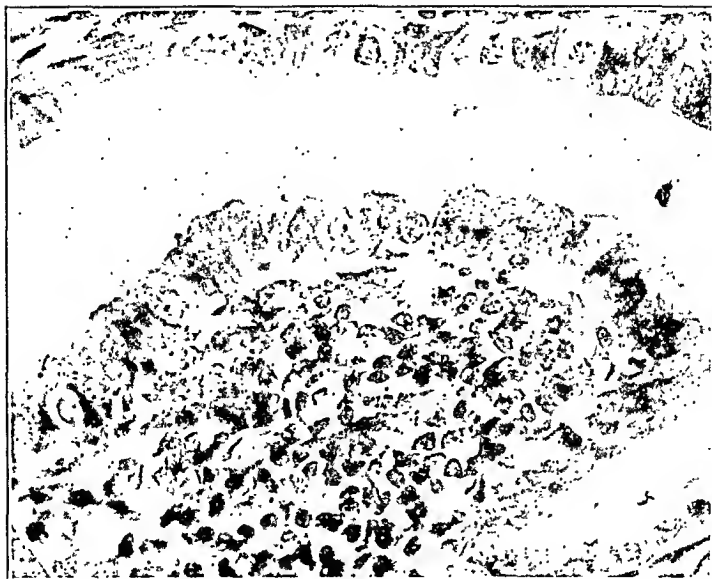


Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.

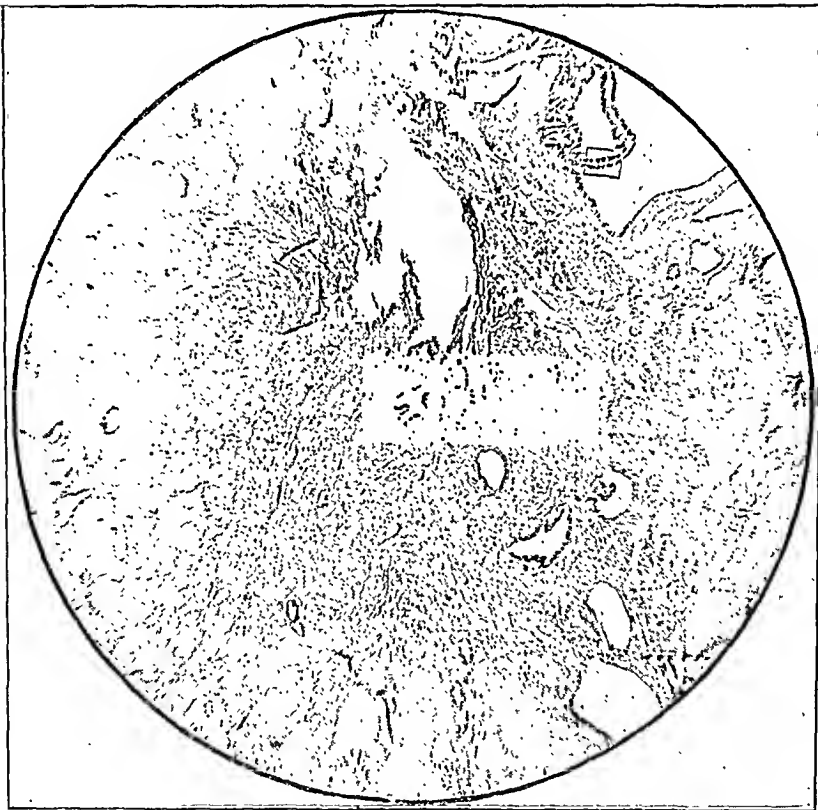


Fig. 7.

Fig. 3.—Gyn. Path. No. 32914. Photomicrograph ($\times 660$) of another gland-like space. This is also lined by tubal epithelium but is surrounded by a little stroma of endometrial type.

Fig. 4.—Gyn. Path. No. 32914. Photomicrograph ($\times 20$) of a cross-section of the tubal isthmus from the same case and same side as Fig. 3. No normal tubal lumen can be seen in this section but there is a marked adenomyomatous process.

Fig. 5.—Gyn. Path. No. 32914. Photomicrograph ($\times 60$) showing higher magnification of area shown at x in Fig. 4. This shows that there is a real endometrium-like tissue with stroma, surface epithelium and glands lining the spaces shown in Fig. 4.

Fig. 6.—Gyn. Path. No. 32914. Photomicrograph ($\times 660$) of region marked by x in Fig. 5, showing that while the stroma is really endometrial in type, the epithelium is tubal.

Fig. 7.—Gyn. Path. No. 33029. Photomicrograph ($\times 40$) showing an adenomyomatous formation in the uterine cornu from another specimen not the subject of previous operation. The area included in the square is indicated by x in Fig. 8.

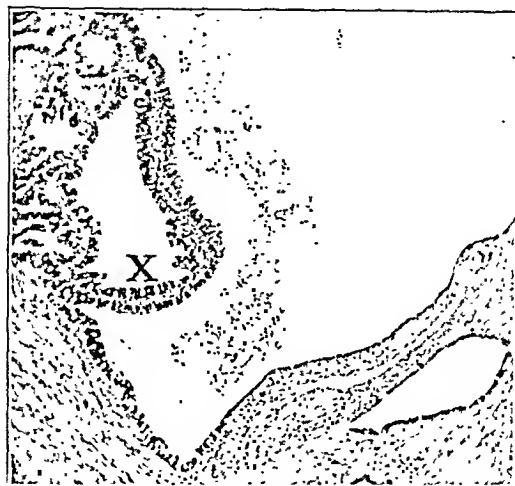


Fig. 8.—Gyn. Path. No. 33029. Photomicrograph ($\times 60$) of an area of adenomyoma from the section shown in Fig. 7. Even at this magnification the two types of cells characteristic of tubal epithelium can be distinguished.

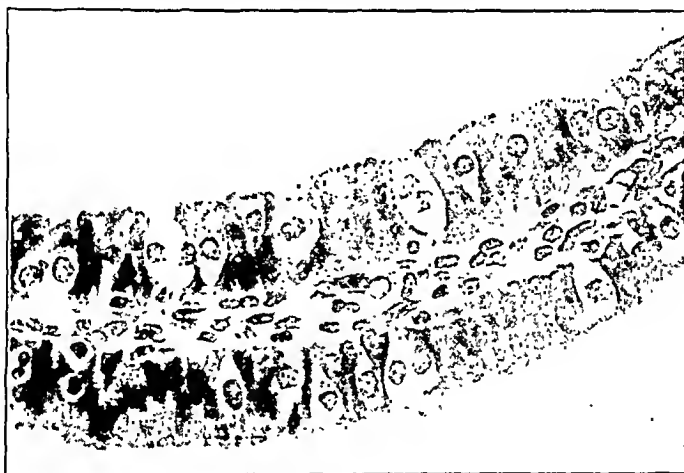


Fig. 9.—Gyn. Path. No. 33029. Photomicrograph ($\times 660$) of the area marked by *x* in Fig. 8. The two types of cells characteristic of tubal epithelium are shown very strikingly.

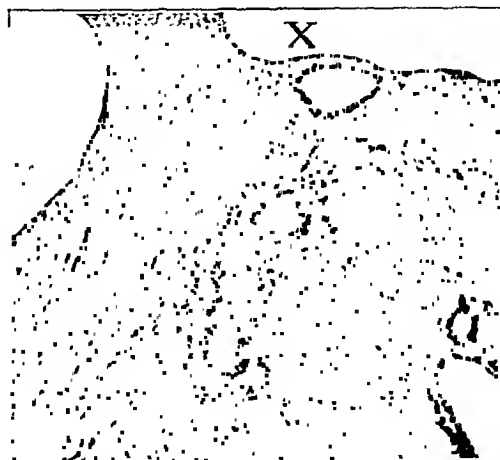


Fig. 10.—Gyn. Path. No. 33029. Photomicrograph ($\times 60$) of another area from the same section as Figs. 8 and 9. This shows real endometrium with stroma and glands.

except for the fact that in them near the periphery are several gland-like spaces lined by tubal epithelium.

CASE 25.—No. 33029. M. E. T., aged fifty-three, colored. L.M.P., seventeen months previous to operation.

Operation.—Feb. 2, 1928, supravaginal hysteromyomectomy; bilateral salpingo-oophorectomy; appendectomy.

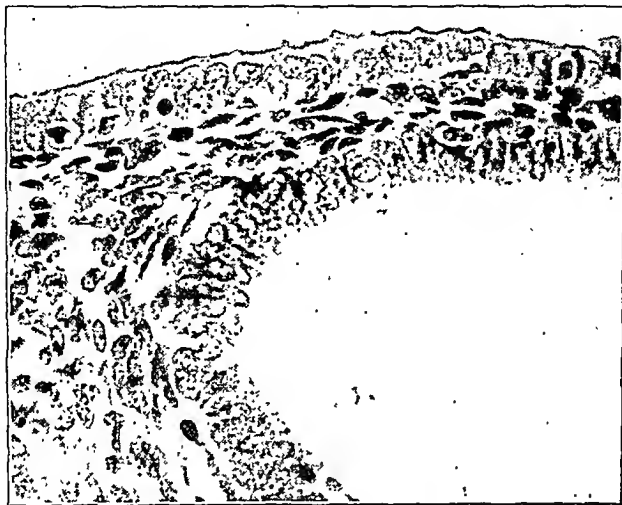


Fig. 11.—Gyn. Path. No. 33029. Photomicrograph ($\times 660$) of area marked by *x* in Fig. 10. This shows that the epithelium in this area is also endometrial in type.



Fig. 12.—Gyn. Path. No. 33141. Photomicrograph ($\times 60$) of real endometrial adenomyoma of the uterine cornu from a specimen not the subject of previous operation.

Pathologic Diagnosis.—Myomas of the uterus, submucous, interstitial, subserous; senile endometrium; adenomyoma of uterine cornua; tubes normal; ovaries senile; appendicitis, chronic.

Description.—Both uterine cornua show in the myometrium numerous gland-like spaces (Fig. 7), for the most part lined by tubal epithelium with the usual two types of cells (Figs. 8 and 9). The lining of a few of the spaces, however, is composed of a uniformly nonciliated type of columnar cell more suggestive of endometrial gland epithelium, and around these is a thin layer of endometrial stroma (Figs. 10 and 11). Deep in one section is a rather large island of endometrium,

CASE 28.—No. 33141. V. R., aged forty-one, colored. L.M.P., doubtful.

Operation.—March 6, 1928; supravaginal hysteromyomectomy; bilateral salpingo-oöphorectomy.

Pathologic Diagnosis.—Myomas of the uterus, submucous, interstitial, subserous; adenomyoma of uterine cornu; interval endometrium; follicular hydrosalpinx, bilateral; atresia of ovaries.

Description.—Both uterine cornua show a large amount of adenomyoma consisting of definite endometrium with both stroma and glands (Fig. 12). There are in addition, however, a few gland-like spaces lined by epithelium which is tubal in type, and without any suggestion of endometrial stroma surrounding them.

In addition to the 37 cases listed above as showing a glandular picture in the uterine cornu or tubal isthmus, 10 cases were found during the course of this study in which the endosalpinx, which normally lines the isthmic and interstitial portions of the tube, was replaced either wholly or in part by endometrium. In four of these cases the sections were from the isthmus, while in the other six they were from

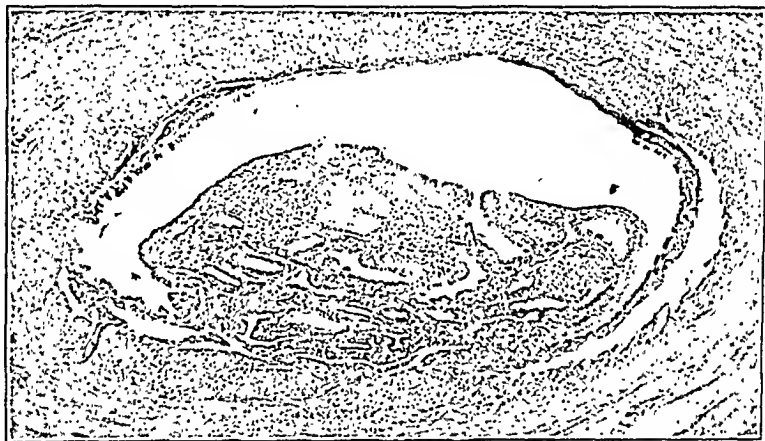


Fig. 13.—Gyn. Path. No. 31127. Photomicrograph ($\times 20$) of lumen of tubal isthmus containing an endometrial polyp. The wall of the isthmus opposite the polyp is lined by tubal epithelium.

the region of the cornual-isthmic junction. In two of the cases there was projecting into one side of the tubal lumen a small endometrial polyp with normal endosalpinx lining the rest of the lumen (Fig. 13). In the other eight cases the endosalpinx was entirely replaced by endometrium (Figs. 14 and 15).

This, it seems to me, furnishes additional evidence that in the uterine cornu and tubal isthmus we are dealing with a region which is variable in its histologic structures. This is the region of transition between the development of the müllerian ducts into tubal tissues on the one hand and uterine tissues on the other. The exact point of this transition is by no means constant, as is shown by these last ten cases. It does not seem surprising, therefore, to find aberrant rests of either tubal mucosa or endometrium, or, as we have seen, both simultaneously at various points in this region. Furthermore, considering the common origin

of these two types of tissue no great stretch of the imagination is required to picture a metaplasia of one of them into the other. It seems to me that some of the cases described above furnish rather convincing evidence that this does actually occur.

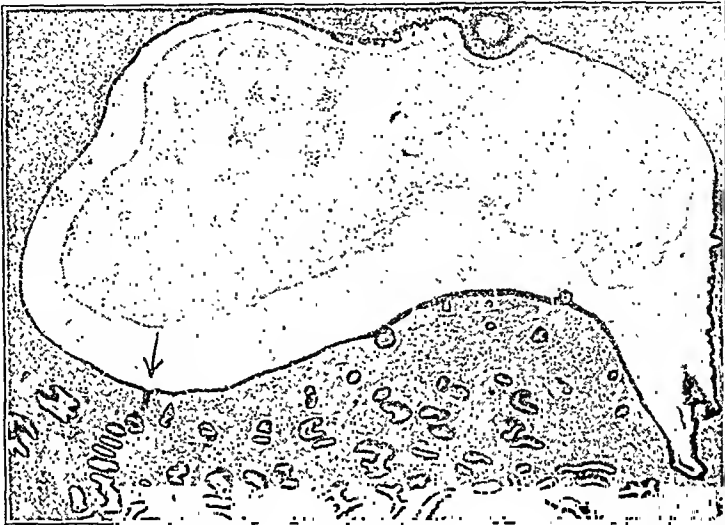


Fig. 14.—Gyn. Path. No. 33268. Photomicrograph ($\times 20$) of tubal isthmus lined by endometrium.

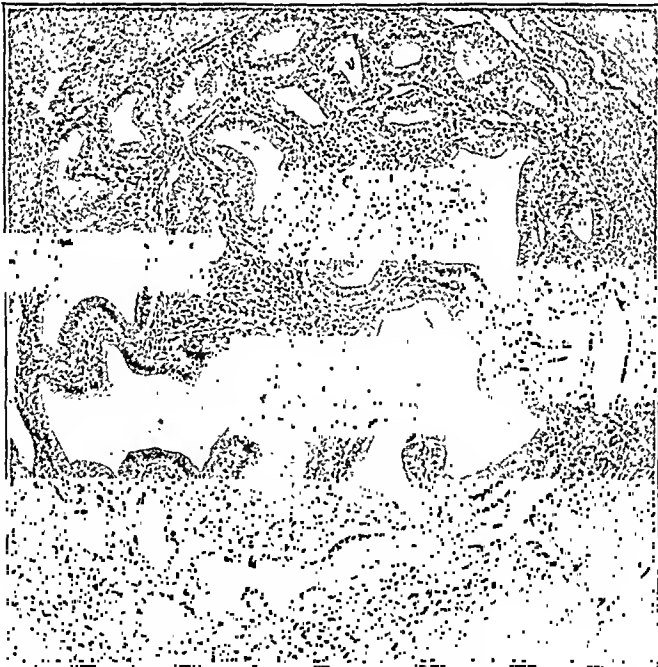


Fig. 15.—Gyn. Path. No. 33361. Photomicrograph ($\times 150$) of interstitial portion of tube lined by endometrium.

It is beyond the scope of this paper to go thoroughly into the origin of these glandular formations in the uterine cornu and tubal isthmus. This subject has been much discussed in the literature and two op-

posite theories have been advanced; one that we have here a true adenomyomatous process, and the other that it results from an inflammatory process in the tube, so-called "salpingitis isthmica nodosa." It is possible that both theories are correct, the one applying to some cases, while the other may be used to explain others. My material certainly tends to show that all of the cases cannot be explained upon an inflammatory basis. As evidence of this it will be seen from Table I that in 8 of the 37 cases presenting a glandular picture in the cornu the tubes were perfectly normal, while in several others there were only the vestiges of a previous, very mild, inflammatory reaction, with practically no distortion of the endosalpinx. On the other hand, of the 85 cases without glandular formation in the cornu, 60 showed some form of salpingitis. It seems evident, therefore, that an inflammatory process is neither essential to the formation of these patterns, nor does it necessarily result in their formation. One must conclude therefore that at least in a certain number of cases they are truly neoplastic adenomyomas.

II. EVIDENCE FOR A TUBAL ORIGIN OF ENDOMETRIOSIS FROM THE LITERATURE

If one studies the literature on the subject carefully, paying particular attention to the descriptions and illustrations of individual cases, there is to be found abundant evidence for a tubal origin of a great many cases reported as endometriosis. In many instances, especially in the cases reported by Sampson, this possibility has been mentioned casually from time to time, but never strongly emphasized.

A very striking example occurs in a report of two cases of "Adenomas of Endometrial Origin in Laparotomy Scars Following Incision of the Pregnant Uterus," by N. Sproat Heaney of Chicago.¹² In this article Fig. 3 shows a high-power picture of a gland in the abdominal scar, and it is quite evident from the presence of two types of cells, ciliated and nonciliated, that the epithelium of this gland is tubal in type. The first operation on this patient had been three years before the second, when a round ligament suspension of the uterus with resection of the uterine ends of the tubes had been done. A six to seven weeks' fetus had also been removed through a fundal incision at the same time, but from the character of the epithelium in the abdominal scar it seems evident that this had arisen from an implant from the tubal resection rather than from the incision of the uterus.

Sampson, in his article on "The Life History of Ovarian Hematomas, etc.," as has been mentioned, suggests the possibility that some of them may be derived from tubal epithelium; and in 5 of the 20 cases described in detail, it is specifically stated that part of the epithelial cells are ciliated (Cases 3, 7, 8, 9, and 11). In two other cases (12 and 13) the description is such as to suggest a tubal rather than an endometrial origin. Similarly, in the article on "Intestinal Adenomas of Endometrial Type,"¹³ the illustrations and descriptions of individual

eases reveal the presence of ciliated cells in several of them, and the possibility of origin of the so-called endometrial implants from either tubal mucosa or endometrium is again mentioned.

In his more recent article on "Endometriosis Following Salpingectomy,"¹⁰ Sampson emphasizes the probability of endometriosis arising from tubal epithelium transplanted by the surgeon in the course of a previous salpingectomy. In summary he makes the following statement: "Post-salpingectomy endometriosis usually arises from sprouts growing out from the traumatized mucosa of the tubal stump. These sprouts may invade not only the wall of the tube but also the uterine cornu and any structure adjacent or adherent to the stump, such as the tissues of the broad ligament, the ovaries (3 cases), and even the abdominal wall (2 cases)."

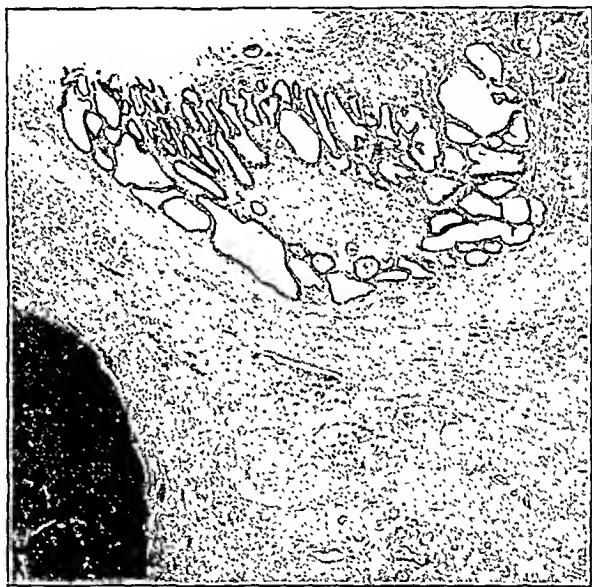


Fig. 16.—Gyn. Path No. 29745. Photomicrograph (X20) showing a portion of a follicular hydrosalpinx included in the substance of the ovary as a result of adhesions. It is conceivable that such an inclusion might, by proliferation, result in an endometriosis of tubal type, or by metaplasia in one of endometrial type.

"The misplaced tubal mucosa in these lesions, at times retains its original structure and at other times *assumes both the structure and function of the uterine mucosa* including its reaction to menstruation and pregnancy If tubal epithelium transplanted during salpingectomy grows, it should also grow if transplanted during other operations than salpingectomy and by other means than operations."

It is this last suggestion thrown out by Sampson that I wish to emphasize as being borne out by the material here presented.

III. INCIDENCE OF TUBAL EPITHELIUM AMONG CASES DIAGNOSED AS ENDOMETRIOSIS

In a careful microscopic analysis of 24 recent consecutive cases diagnosed as endometriosis in our laboratory I have found that in 6 of

them the process was definitely of tubal origin, or at least that the epithelial lining of the cysts was definitely tubal in type. In 8 cases there was definite endometrium only, while in 3 cases both endometrial and tubal types of epithelium were present. In the 7 other cases the epithelium was so distorted by compression from hemorrhage into the cysts or by a superimposed inflammatory process that it was impossible definitely to distinguish its type. There follows a more detailed description of some of the more interesting and important cases in this series.

CASE 2.—No. 29745. M. W., aged thirty-seven, colored.

Operation.—Supravaginal hysteromyomectomy; right salpingo-oophorectomy; left salpingectomy; appendectomy.



Fig. 17.—Gyn. Path. No. 31372. Photomicrograph (X660) of a small endometrial cyst of the ovary lined by real endometrial epithelium. Note the mitotic figure at *m.* These rarely occur in tubal epithelium.

Pathologic Diagnosis.—Myomas of the uterus, interstitial and subserous; salpingitis, chronic, follicular, bilateral; endometriomas of the right ovary; appendix normal.

Description.—The sections of the ovary show several cysts without epithelial lining and with a surrounding zone of fresh hemorrhage. They may be either endometrial cysts in which the lining epithelium has been destroyed by hemorrhage, or what is more likely they may be small corpus luteum hematomas. There is, however, embedded in the substance of the ovary a definite fragment of a follicular hydrosalpinx (Fig. 16). It is conceivable that the endosalpinx herein contained might by metaplasia become endometrium thus giving rise to endometriosis of the ovary.

CASE 3.—No. 31372. V. C., aged thirty, white.

Operation.—Left salpingo-oophorectomy; appendectomy.

Pathologic Diagnosis.—Endometrial cysts of ovary; tube normal; appendix normal.

Description.—The ovary contains several follicular retention cysts and in addition there is a slit-like crevice lined by a single layer of deeply staining columnar epithelium quite similar to that seen in endometrial glands in the early interval stage. This is surrounded by a loose stroma in which are a few glands lined by the same type of epithelium (Fig. 17). There are even a few mitoses which are practically never seen in tubal epithelium. In the same section, however, about 1 cm. away, is a single gland-like space lined by tubal epithelium with the characteristic two types of cells (Fig. 18).

CASE 4.—No. 31386. L. F., aged thirty-two, white.

Operation.—Panhysterectomy; bilateral salpingo-oöphorectomy.

Pathologic Diagnosis.—Uterus normal; salpingitis, chronic, left; endocervicitis, chronic; endometrial cysts of ovary, left.

Description.—The left tube and ovary are closely adherent and the sections taken show several cross-sections of the tubal lumen. In the substance of the ovary, however, is a cystic space surrounded by stroma markedly like that of endometrium, and containing glands. The epithelium lining both the main cavity of the cysts and



Fig. 18.—Gyn. Path. No. 31372. Photomicrograph (X660) of a similar cyst from the same ovary but lined by tubal epithelium. Note the large phagocytic cells in the stroma containing blood pigment.

the glands is tubal in type with the characteristic ciliated and nonciliated cells (Fig. 19). In places there is considerable hemorrhage into the stroma. At another point some little distance away is another small area of typical endometrial stroma with a few glands the lining epithelium of which is also typically endometrial in type, even showing mitoses (Fig. 20).

This strikes me as a case in which the process has originated probably as an inclusion of tubal epithelium in the substance of the ovary, perhaps as a result of the inflammatory process which has evidently gone on in the past. At the time of removal, however, considerable metaplasia has taken place, until with the acquisition of stroma and glands, there are many of the features of real endometrium (in the last small area described, all of them). The epithelium, however, in the larger area still maintains its tubal characteristics, thus giving us a lead as to the primary origin of the process.

CASE 5.—No. 31502. M. F., aged twenty-nine, white.

Operation.—Right salpingo-oöphorectomy; excision of cyst of left ovary; modified Coffey suspension of uterus; appendectomy.

Pathologic Diagnosis.—Endometrial cyst of right ovary; corpus luteum cyst of left ovary; tube normal; appendix normal.

Description.—The cyst of the right ovary, which grossly is about 4 cm. in diameter and filled with dark brown blood, is seen microscopically to be lined by a single layer of epithelium which for the most part is so flattened and distorted by compression that little can be made out as to the nature of the cells. In a few



Fig. 19.—Gyn. Path. No. 31386. Photomicrograph ($\times 660$) of an area of ovarian endometriosis showing uterine stroma but tubal epithelium.

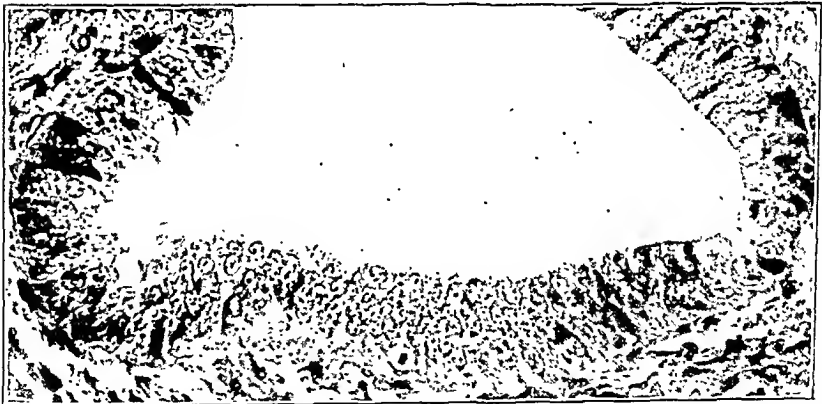


Fig. 20.—Gyn. Path. No. 31386. Photomicrograph ($\times 660$) of another area of endometriosis from the same ovary as Fig. 19 but showing the endometrial type of epithelium. Again note the mitoses.

small areas where the cells are better preserved they resemble more closely those of tubal than those of uterine mucosa. Beneath the the epithelium is a layer of loose stroma resembling endometrial stroma which is quite vascular and contains considerable blood pigment. On the surface of the ovary in one area are several papilla-like projections covered by tubal epithelium (Fig. 21).

CASE 6.—No. 31597. F. P., aged forty-seven, white.

Operation.—Supravaginal hysterectomy; bilateral salpingo-oöphorectomy; appendectomy.

Pathologic Diagnosis.—Tuboovarian abscess, left; ovarian abscess and chocolate cyst, right; periappendicitis, chronic.

Description.—The abscess occupies most of the right ovary, but situated in the ovarian stroma, outside of the inflammatory membrane lining the abscess cavity, are several gland-like spaces lined by tubal epithelium. There is also one small cyst filled with old blood and lined by columnar epithelium similar to that found in the tube. Of more significance than the picture seen in the ovary, however, is



Fig. 21.—Gyn. Path. No. 31502. Photomicrograph ($\times 660$) of a bit of tubal epithelium attached to the surface of an ovary.



Fig. 22.—Gyn. Path. No. 31597.—Photomicrograph ($\times 660$) of a portion of a gland from an area of adenomyoma of the uterus. The stroma is uterine but the epithelium is tubal in type.

a small area of adenomyoma found alone in the uterine wall near the peritoneal surface. This shows typical endometrial stroma and a few glands lined by epithelium of the endometrial type. A greater number of glands, however, are lined by epithelium which is characteristically tubal (Fig. 22).

CASE 7.—No. 31630. R. B., aged twenty-six, colored.

Operation.—Salpingo-oöphorectomy, left; salpingectomy, right; appendectomy.

Pathologic Diagnosis.—Endometrial cyst of left ovary; salpingitis, chronic, bilateral; appendix normal.

Description.—The left ovary contains in its substance a small cyst lined by well-preserved endometrium in the interval phase. There are also a few tubules lined by tubal epithelium, but as there is a definite chronic salpingitis with the tube closely adherent to the ovary, and as these tubules are all situated near the adherent tube, they are probably of little significance.

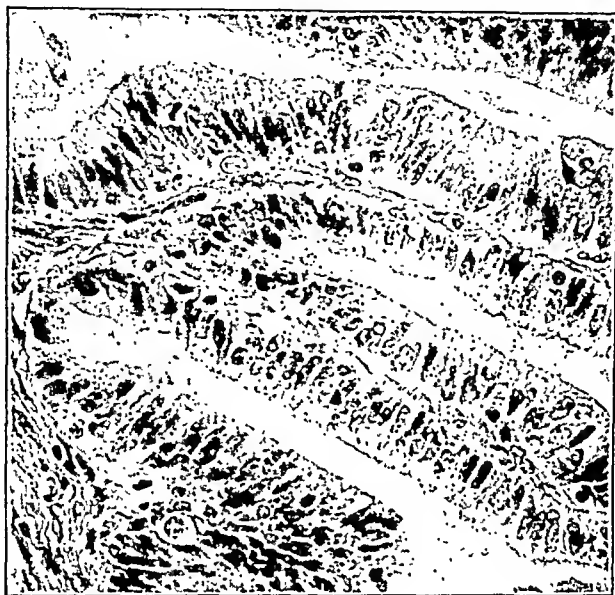


Fig. 23.—Gyn. Path. No. 31856. Photomicrograph ($\times 660$) of a portion of a small hemorrhagic cyst of the ovary. The gross configuration suggests somewhat the folds of the endosalpinx and the epithelium resembles a little more closely that ordinarily found in the tube than it does that of endometrium.



Fig. 24.—Gyn. Path. No. 31856. Photomicrograph ($\times 660$) of a part of the wall of a hemorrhagic cyst in the other ovary from the same case as Fig. 23. In the epithelium are seen the two types of cells characteristic of tubal epithelium.

CASE 9.—No. 31839. Mrs. F., aged thirty-four, white.

Operation.—Supravaginal hysterectomy; bilateral salpingo-oophorectomy; appendectomy; cholecystectomy.

Pathologic Diagnosis.—Endometrial cysts of left ovary; pelvic endometriosis; tubes and appendix normal.

Description.—On the surface of the ovaries are many adhesions with old hemorrhage, and an occasional bit of epithelium, which, however, is so distorted that it is impossible to classify it as tubal or endometrial. In the left ovary is a cystic cavity filled with old blood and lined by epithelium which in places is so distorted by compression that it is impossible to recognize its type. In other areas, however, it is better preserved and resembles more closely tubal epithelium than it does that of endometrium. There is no stroma, but the surrounding ovarian tissue contains many phagocytic cells containing much blood pigment.

CASE 10.—No. 31856. N. M., aged forty-two, white.

Operation.—Supravaginal hysteromyomectomy; bilateral salpingo-oöphorectomy; appendectomy.

Pathologic Diagnosis.—Myoma uteri, mural; normal endometrium; normal tubes; endometrial cysts of the ovaries; peritoneal endometriosis; appendix normal.

Description.—The epithelium in the peritoneal implants cannot be definitely classified. In one ovary is a cyst 5 or 6 cm. in diameter, with a wall consisting of lamellated layers of connective tissue in which there are many large phagocytic cells



Fig. 25.—Gyn. Path. No. 31930. Photomicrograph (X660) of a portion of the wall of a small hemorrhagic cyst of the ovary. The epithelium is typically tubal in type, and at x may be seen the extrusion phenomenon of the nonciliated cells described by Novak and the author.

containing blood pigment. The epithelium lining this cyst is for the most part composed of a single layer of columnar cells which are not easily classified as tubal or endometrial in type, though they resemble a little more closely the former. In two areas there is a bit of stroma containing glands, and at still another point a smaller cystic cavity with epithelial lined papillary projections into it, somewhat resembling the cross-section of an endosalpinx. This epithelium, however, is also difficult to classify (Fig. 23). In the other ovary is a smaller cyst with well-preserved epithelial lining in which the character of the cells is definitely tubal (Fig. 24).

CASE 11.—No. 31930. M. B., aged forty-one, white.

Operation.—Bilateral oöphorectomy.

Pathologic Diagnosis.—Endometrial cysts of both ovaries; follicular and corpus luteum cysts of right ovary.

Description.—Both ovaries contain epithelial lined cysts filled with old blood. Beneath the epithelium is a thin layer of stroma with phagocytic cells and blood pigment, but there are no glands. The epithelium of both is composed of the two types of cells characteristic of tubal epithelium, and in one the secretory or non-ciliated cells show the extrusion phenomenon described by Novak and myself¹¹ (Fig. 25).



Fig. 26.—Gyn. Path. No. 32236. Photomicrograph ($\times 660$) showing tubal epithelium lining an endometrial cyst of the ovary.



Fig. 27.—Gyn. Path. No. 32236. Photomicrograph ($\times 150$) of another area from the wall of the same cyst as is shown in Fig. 26. This shows typical endometrium in the interval stage.



Fig. 28.—Gyn. Path. No. 32236. Photomicrograph ($\times 150$) showing still another area of the wall of the cyst as shown in Figs. 26 and 27. This also resembles true endometrium, but the epithelium lining the glands is tubal in type.

CASE 12.—No. 32236. S. F., aged forty-eight, white.

Operation.—Supravaginal hysteromyomectomy; bilateral salpingo-oöphorectomy; appendectomy.

Pathologic Diagnosis.—Myomas of the uterus, mural and submucous; endometrial cysts of the ovaries, bilateral; salpingitis, chronic, bilateral; appendix normal.

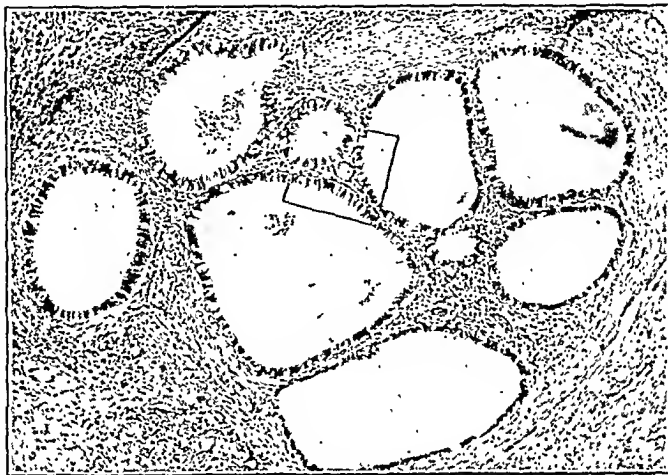


Fig. 29.—Gyn. Path. No. 32278. Photomicrograph ($\times 62$) of an adenomyoma of the umbilicus. Even at this magnification the epithelium can be recognized as tubal in type.

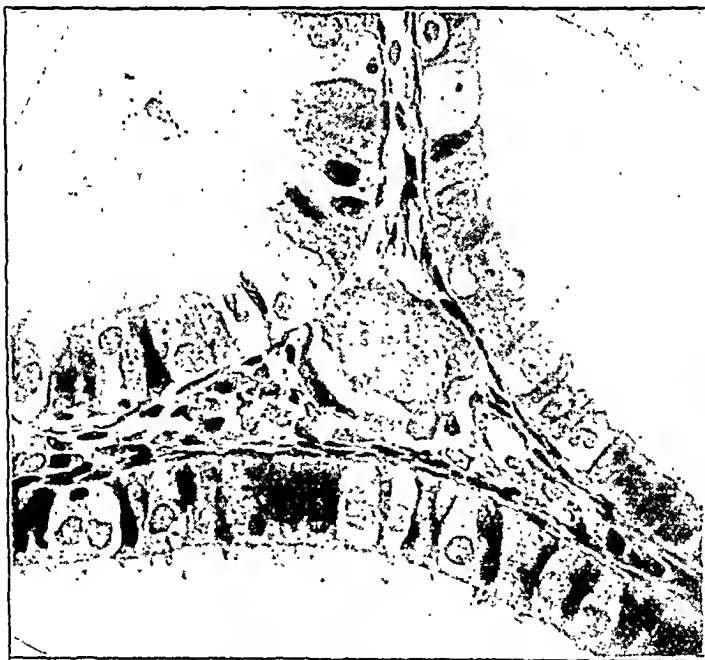


Fig. 30.—Gyn. Path. No. 32278. Photomicrograph ($\times 660$) of a small area from Fig. 29. This is a striking illustration of the characteristic features of tubal epithelium.

Description.—The endometrial cyst of one ovary is most striking in the variety of its cellular structure. It is lined for the most part by a single layer of columnar epithelium which is typically tubal in type (Fig. 26). This epithelium overlies a thin layer of loose stroma in which there are pigment-laden phagocytes. In several areas the stroma is thicker and contains definite glands. In one of these areas the

glands are typical of endometrium in the interval stage (Fig. 27), while in another area near by the glands present the same configuration but are lined by tubal epithelium (Fig. 28). It seems to me that in this one cyst we have possibly represented various stages in a metaplasia of tubal epithelium into endometrium. Fig. 26 represents the beginning, simple tubal epithelium with the addition of a small amount of endometrial stroma. Fig. 28 presents an intermediate stage where the stroma has been penetrated by glands, but the glands are still lined by tubal epithelium. In Fig. 27 we have the final stage, true endometrium.

CASE 13.—No. 32278. E. B., aged thirty-two, colored.

Operation.—Supravaginal hysteromyomectomy; left salpingo-oophorectomy; partial resection of right ovary; resection of left round ligament; appendectomy; umbilectomy.

Pathologic Diagnosis.—Myomas of the uterus, subserous; endometriosis of ovaries, left round ligament, pelvic peritoneum and umbilicus.

Description.—Evidence of endometriosis can be found in all the regions mentioned, in the form of an abundance of scar tissue with considerable extravasation

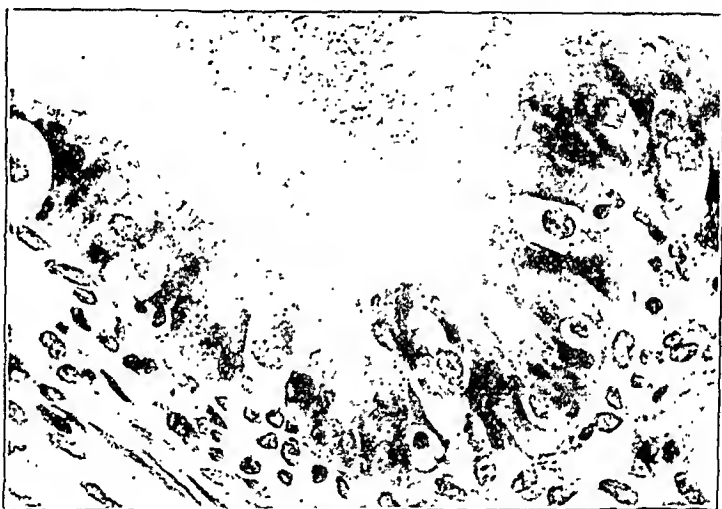


Fig. 31.—Gyn. Path. No. 33016. Photomicrograph ($\times 660$) of a portion of the wall of a small hemorrhagic cyst of the ovary. The epithelium is typically tubal, but there is a thin layer of stroma suggestive of endometrium.

of old blood, and phagocytic cells containing blood pigment. In the ovaries are several small cysts and tubules lined by typical tubal epithelium. There is also evidence of old hemorrhage into the substance of the ovaries and numerous small areas of calcification are present usually near the tubules and cysts. Similar tubules lined by tubal epithelium are found here and there beneath the peritoneum covering the myoma.

The section of the umbilicus is most striking. In it can be seen a group of gland-like spaces with a small amount of intervening stroma resembling closely that of normal endometrium. Around this group of glands is a considerable amount of fibromuscular tissue, so that the structure is that of an adenomyoma of the umbilicus. The epithelium lining the glands, however, is a beautiful example of tubal epithelium showing very strikingly the ciliated and nonciliated cells (Figs. 29 and 30). In his book on *The Umbilicus and Its Diseases*,¹⁴ Cullen has fully discussed such tumors, describing one case from his own observations and collecting several others from the literature.

CASE 17.—Gyn. Path. No. 33016. C. C., aged twenty-six, white.

Operation.—Myomectomy; right oophorectomy; resection of cyst of left ovary.

Pathologic Diagnosis.—Adenomyoma uteri; endometrial and follicular cysts of right ovary; corpus luteum cyst of left ovary.

Description.—Almost in the center of the right ovary is a small cyst, about 1.5 cm. in diameter, filled with old blood, and lined by a single layer of columnar epithelium which is well preserved and typically tubal in type. Beneath this is a thin layer of tissue resembling endometrial stroma and containing considerable extravasated old blood (Fig. 31).



Fig. 32.—Gyn. Path. No. 33016. Photomicrograph ($\times 660$) from a section showing adenomyoma of the uterus in the same case as in Fig. 31. The glands and stroma here are typically endometrial.

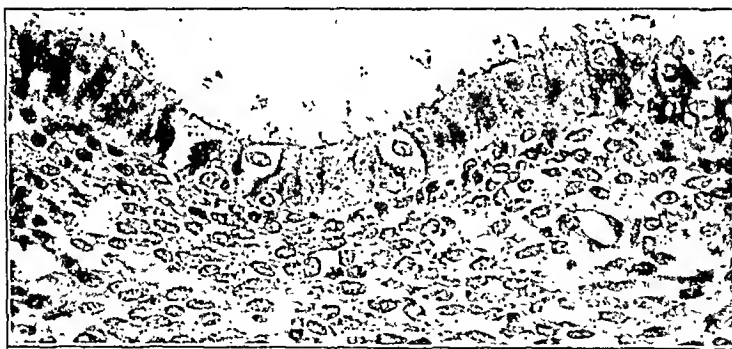


Fig. 33.—Gyn. Path. No. 33016. Photomicrograph ($\times 660$) of another area of adenomyoma of the uterus from the same section as Fig. 32. The stroma here is uterine in type but the epithelium is tubal.

In the portion of the uterus removed there are numerous extensive islands of adenomyoma. These for the most part are composed of true endometrium with a hyperplasia pattern showing dense stroma and glands, varying greatly in size and lined by typical uterine epithelium with even an occasional mitotic figure (Fig. 32). In a few smaller islands, however, though there is still an abundance of endometrial stroma, the epithelium lining the glands is tubal in type (Fig. 33).

CASE 18.—Gyn. Path. No. 33026. N. B. H., aged forty, white.

Operation.—Supravaginal hysterectomy; right salpingo-oophorectomy.



Fig. 34.—Gyn. Path. No. 33026. Photomicrograph ($\times 660$) through the wall of a small hemorrhagic cyst of the ovary, showing endometrial stroma and tubal epithelium.

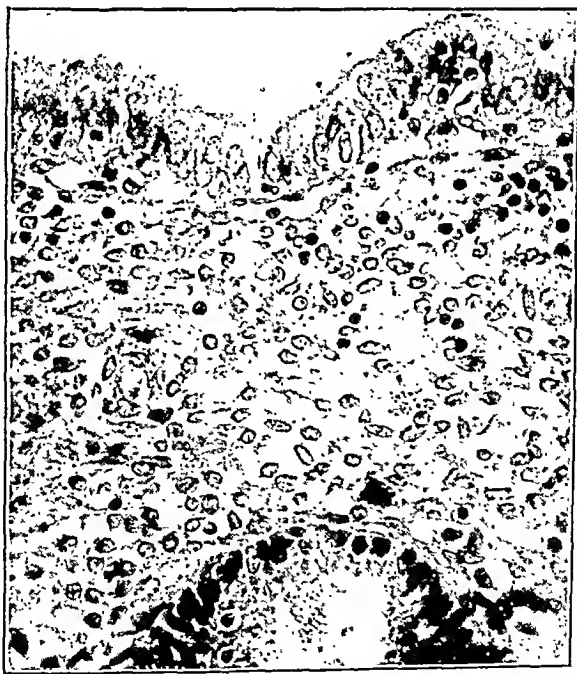


Fig. 35.—Gyn. Path. No. 33026. Photomicrograph ($\times 660$) of a portion of the wall of another hemorrhagic cyst from the same ovary as in Fig. 34. The tissues here, both epithelium and stroma, are typically uterine.

Pathologic Diagnosis.—Adenomyoma uteri; endometrial polyp; premenstrual endometrium; follicular, simple serous, and endometrial cysts of right ovary; pelvic endometriosis; normal right tube.

Description.—There is no diffuse adenomyoma of the uterus but there are several islands of endometrial tissue embedded deep in the myometrium at widely separated spots. One of these is near the base of an endometrial polyp and several others occur just beneath areas of adhesions on the posterior peritoneal surface. All of these areas show typical endometrium with normal glands and stroma.

One of these areas is located in the right uterine wall posteriorly just beneath a point where the right ovary is adherent to the uterus. This adherent portion of the ovary contains several hemorrhagic cysts varying in size from a few millimeters to two centimeters in diameter and exhibiting various stages in development. One of the smaller ones, while surrounded by an endometrial type of stroma, is lined by typical tubal epithelium (Fig. 34). Another larger cyst is lined by typical well-preserved endometrium, with stroma, surface epithelium and glands all uterine in type (Fig. 35). In a still larger cyst the epithelial lining has been destroyed, presumably by compression from the contained blood.

CASE 20.—Gyn. Path. No. 33422. J. K., aged forty-two, white.

Operation.—Bilateral salpingo-oophorectomy.

Pathologic Diagnosis.—Endometrial cysts, follicular cysts, and corpus luteum hematomas of the ovaries; tubes normal.

Description.—Both ovaries contain hemorrhagic cysts lined by definite endometrium with typical stroma and glands. The surface epithelium, however, in places shows two types of cells, ciliated and nonciliated, suggestive of tubal epithelium.

SUMMARY

It has been pointed out that an adenomatous formation composed of either tubal epithelium or endometrium, or in a few cases of both simultaneously, occurs rather frequently in the region of the uterine cornu and tubal isthmus. A previous operative trauma of this region is not essential for the production of such an adenomatous formation, nor is it necessarily associated with any previous inflammatory process. It may be considered then as a truly neoplastic formation or primary adenomyoma.

From the types of epithelium described in these adenomyomas it is evident that they may arise from tubal epithelium as well as endometrium. The presence in a few cases of spaces lined by tubal epithelium as well as islands of true endometrium in the same specimen suggests the possibility of a metaplasia of one of these types of mucosa into the other. The finding of gland-like spaces lined by tubal epithelium but surrounded by endometrial stroma is even more suggestive of this possibility. The finding of ten cases in which the interstitial or isthmic portion of the tube is lined by endometrium rather than tubal mucosa is further evidence of the histologic variability of this region, and suggests again the possibility of a metaplasia of one of these types of mucosa into the other.

Evidence gathered from the literature, particularly from the work of Sampson, tends to show that a number of cases reported as endometriosis are really cases of aberrant tubal epithelium. It is noted, however, that Sampson has called attention to this fact from time to

time, and in a more recent work on "Endometriosis Following Salpingectomy" has stressed the probability of a metaplasia of tubal mucosa into endometrium.

In a review of 24 cases diagnosed as endometriosis in our own laboratory it has been found that in a third of them the epithelial elements were definitely tubal in type. In some of them there was in addition to the tubal epithelium an endometrial-like stroma. In a few instances cysts lined by tubal epithelium and others with real endometrium occurred in the same case. In one very striking case the same hemorrhagic cyst of an ovary was lined in part by tubal epithelium, while another area of the cyst wall showed real endometrium with stroma and glands. Such cases lend additional evidence to the hypothesis that tubal epithelium may, by metaplasia, be transformed into endometrium.

CONCLUSIONS

From the evidence presented above we may derive the following conclusions:

1. An operative trauma is not necessary for the production of an adenomatous process in the uterine cornu or tubal isthmus.
2. Such adenomatous processes do not necessarily result from an inflammatory process.
3. The tissues involved in such an adenomatous process may be either tubal mucosa or endometrium, or both in one and the same case.
4. There is evidence to suggest that in some cases in which endometrium is present it may arise from tubal epithelium by metaplasia.
5. Many cases diagnosed as endometriosis are really collections of cystic spaces lined by tubal epithelium.
6. In some cases of ovarian and pelvic endometriosis real endometrium and spaces lined by tubal epithelium occur simultaneously, again suggesting the possibility of metaplasia.

Finally, I wish to thank Dr. Thomas S. Cullen for permission to undertake this study and for his helpful criticisms and suggestions, and Dr. Gerald B. Hurd for his painstaking assistance in preparing the photomicrographs.

REFERENCES

- (1) *Russell, W. W.*: Bull. Johns Hopkins Hosp. 10: 8, 1899. (2) *V. Franque, O.*: Sitzungber. der Physikal. Med. Gesellsch. in Würzburg, No. 4, 1898. (3) *Casler, D. B.*: Tr. Am. Gynec. Soc. 44: 69, 1919. (4) *Cullen, T. S.*: Am. Jour. Obst. & Dis. Women 80: 130, 1919. (5) *Cullen, T. S.*: Arch. Surg. 1: 215, 1920. (6) *Norris, Charles C.*: AM. J. OBST. & GYNEC. 1: 831, 1921. (7) *Janney, James C.*: AM. J. OBST. & GYNEC. 3: 173, 1922. (8) *Sampson, J. A.*: Arch. Surg. 3: 245, 1921. (9) *Idem.*: AM. J. OBST. & GYNEC. 4: 451, 1922. (10) *Idem.*: AM. J. OBST. & GYNEC. 16: 461, 1928. (11) *Novak, Emil, and Everett, H. S.*: AM. J. OBST. & GYNEC. 16: 499, 1928. (12) *Heaney, N. Sproat.*: AM. J. OBST. & GYNEC. 10: 625, 1925. (13) *Sampson, J. H.*: Arch. Surg. 5: 217, 1922. (14) *Cullen, T. S.*: The Umbilicus and Its Diseases, Philadelphia, 1916, W. B. Saunders Company, pp. 373-399.

A CLINICOPATHOLOGIC STUDY OF ECLAMPSIA BASED UPON THIRTY-EIGHT AUTOPSIED CASES

BY HONORIA ACOSTA-SISON, M.D., MANILA, P. I.

(From the Department of Obstetrics, College of Medicine, University of the Philippines)

✓

IN THE paper "Status of Eclampsia in the Philippines" Acosta-Sison and Baens discussed in detail the clinical picture of the disease together with its incidence, prognosis, and mortality as observed among Filipinos. In the present study, an effort was made to develop the correlation of the symptomatology with the pathologic findings and so only the autopsied cases were chosen for our material. As 15 patients, or 38.4 per cent of our cases presented besides liver involvement also varying degrees of chronic nephritis which however was not marked, the clinical data were separated into two groups according to whether the pathologic findings revealed chronic nephritis or not.

None of the patients had prenatal care and 33 of them were admitted unconscious and with history of one or more convulsions at home; four had convulsions a few hours after admission, and one arrived in an apparently good condition except for some bleeding caused by marginal previa.

There was no outstanding difference in the clinical manifestation of both groups. The mode of onset was almost the same. All the cases with one exception in each group had edema of a greater or lesser extent either in the lower extremities alone or also in the face from a few days to over a week before the onset of convulsions. Seven cases, one of them belonging to the chronic nephritic group, had anasarca before the convulsions. Headache in those who had convulsions was a constant complaint occurring either a few hours to a few days before the first attack. This emphasizes the importance of headache as a sign of imminent convulsion.

The uranalysis on admission showed a marked trace of albumin, many casts and erythrocytes in 66.66 per cent in Group I and in 85 per cent in Group II. The rest of the cases had moderate albumin and a few casts.

The blood pressure was high, from 140 to 270 systolic in 22 cases and from 120 to 135 systolic in 6; one case had only 107 systolic. The diastolic pressure oscillated from 80 to 180 in 29 cases.

The temperature ranged from 38° C. to 41° C. in 25, or 64 per cent of the cases; whereas in twelve the temperature was merely from 37° C. to 37.5° C., the pulse was rapid, from 100 to 160 in 30, or 76.9 per cent, and from 84 to 92 in 8 cases. In one case, it was only 82.

TABLE I. CLINICAL PICTURE OF ECLAMPSIA GROUPED ACCORDING TO THE PRESENCE OR ABSENCE OF CHRONIC NEPHRITIC LESION AT AUTOPSY

	ECLAMPSIA WITHOUT CHRONIC NEPHRITIS 23 CASES	ECLAMPSIA SUPERIMPOSED ON CHRONIC NEPHRITIS 15 CASES	TOTAL 38 CASES
1. VARIETIES:			
Antepartum	12	7	19
Intrapartum	10	6	16
Postpartum	1	2	3
2. CONDITION OF PATIENT WHEN FIRST SEEN:			
In semiconscious or comatose condition with one or more convulsions at home	19	13	32
Conscious but had convul- sions within a few hours after admission to the hos- pital	4	1	5
Conscious but died soon aft- er an agonal rigidity (45')	1		1
3. EDEMA OF THE LOWER EXTREM- ITIES ALONE OR ALSO OF THE FACE:	21 (Of these, 6 had anasarca)	14 (Of these, 1 had anasarca).	35 (Anasarca 7)
No edema	2	1	3
4. URANALYSIS:			
a) Heavy albumin, many casts and red cells	66.66%	85%	
b) Moderate albumin and casts	33.33%	15%	
5. BLOOD PRESSURE:	Cases	Cases	Cases
Systolic	{ 150-220 — 13 125-130 — 3 107 — 1	140-270 — 9 120-130 — 3	140-270 — 22 120-155 — 6
Diastolic	{ 102-175 — 13 80-100 — 3 75 — 1	30-180 — 12	75-180 — 29
6. TEMPERATURE ON ADMISSION:			
38° C. to 41° C.	17	8	25
37° C. to 37.5° C.	7	6	13
7. PULSE RATE ON ADMISSION TO THE HOSPITAL:			
100 to 140	18	11	29
160	1	0	1
8. RESPIRATORY RATE:			
28 to 40	17	13	30
20 to 26	7	2	9
9. AGE OF PREGNANCY:			
5 months	1	0	1
6 months	0	1	1
7 months	1	1	2
8 months	2	4	6
9 months	18	7	25
Not stated	1	2	3
10. PARITY:			
Primipara	19	8	27
Multipara	4	6	10
Relative proportion of pri- mipara and multipara	4¾ primipara to 1 multipara	11⅓ primipara to 1 multipara	2.7 primipara to 1 multipara

delivered patients treated conservatively on account of undilated cervix, amounting to 51.2 per cent of the total. This does not necessarily argue against the conservative treatment, for it is probable that had these cases been cesareanized they would have been also lost, it rather indicates a severe toxic condition that overwhelmed the patients beyond recovery before or in the early stage of labor. In the survey on eclampsia among Filipinos referred to, the advantage of the conservative over the radical treatment, performed under general anesthesia, had been shown. The authors believe, nevertheless, that cesarean section should be performed in very severe cases where the fetuses are still alive, for the sake of the latter.

In the 36 cases that had convulsions, death occurred from two to forty-eight hours after the initial convulsion. One patient lived for ten days, and another for twelve days. Both of these had chronic nephritic lesions. The patients that lived the shortest time after the first convulsion were those who died undelivered. As a general rule those that presented chronic nephritic lesions lived longer after the initial convulsion than those who were otherwise free. It seems paradoxical that patients who had chronic nephritis could live longer. Perhaps, with such a lesion, the maternal organism acquires a certain degree of resistance, so to speak, which allows a slower death although it predisposes the patient to the eclamptic attack before the full term is

TABLE II. LIVER IN ECLAMPSIA, 38 AUTOPSIES

	NO. CASES	PERCENTAGE
Larger than normal	8	21.0
Softer than normal and friable	10	29.4
Pale	8	21.0
Pale yellowish	13	34.0
Grayish white	2	5.26
Disturbances in the circulation	21	55.0
Congestion	7	17.9
Hemorrhages	24	63.0
Discrete from 1 mm. to 2 cm. in diameter	20	51.0
Petechial	4	10.0
Location of hemorrhage, throughout but especially under the capsule	10	29.4
Throughout but especially in the right lobe	2	5.26
No hemorrhages	7	18.4
Alteration in the parenchyma:		
Cloudy swelling	2	5.26
Fatty degeneration throughout liver substance	5	13.1
Fatty degeneration around central vein	1	2.6
Fatty degeneration especially around portal areas	3	7.8
Focal necrosis scattered indistinctly in liver substance	26	68.40
Focal necrosis especially in portal and central areas, extensive	1	2.6
Focal necrosis especially around the central vein	1	2.6

over. The eclampsia cases without chronic affection of the kidneys would seem to be overwhelmed with the poison and either die quickly or their previously healthy organs return quickly to their normal condition, when properly treated in the early stage.

From the Tables II to X it can be seen that the liver and kidneys are the organs most constantly affected. The heart, lungs, and brain are also affected but in a smaller number of cases.

Liver.—The main changes found in the liver were disturbances in its circulation ranging from congestion (7 cases), petechial hemorrhages (4

TABLE III. KIDNEYS IN ECLAMPSIA, 38 AUTOPSIES

Acute parenchymatous degeneration		13
Marked	1	
Slight but accompanied by marked liver changes	3	
Hemorrhagic necrosis		2
Acute glomerulo nephritis		1
Subacute nephritis		6
Anemia and cloudy swelling		1
Chronic nephritis		15
Chronic parenchymatous	5	
Chronic interstitial	9	
Chronic interstitial, only slight	1	
Chronic interstitial, subacute nephritis	2	
Chronic interstitial, acute glomerulo nephritis	1	
Pyelonephritis	1	

TABLE IV. HEART IN ECLAMPSIA, 38 AUTOPSIES

	NO. OF CASES
Normal	13
Pale and soft	6
Congestion	2
Subendothelial petechial hemorrhages	1
Slight hypertrophy	1
Hypertrophy, right	2
Hypertrophy, left ventricle and epicardial petechial hemorrhage	1
Dilatation, especially right	1
Fatty degeneration and hypertrophy	4
Fatty degeneration and petechial hemorrhages	1
Acute endocardial degeneration	4
Chronic vegetative rheumatic endocarditis	1
Chronic myocarditis and valvulitis	1

cases), to large discrete hemorrhagic patches (21 cases) varying in size from a few millimeters to 2 cm. in diameter. In 7 cases no hemorrhages were found. The parenchyma varied from mere cloudy swelling (32 cases), fatty degeneration (7 cases), and focal necrosis (28 cases). It should be noted that Pelliet,² Schmorl,³ Williams,⁴ Opie⁵ and Fahr⁶ regard peripheral necrosis of the lobule as the characteristic liver lesion in eclampsia. The necrosis is said to be produced by pressure from the extravasated blood that has escaped through the portal capillaries. Efforts were made to find these supposedly pathognomonic lesions of eclampsia. We found the portal areas especially affected

TABLE V. LUNGS IN ECLAMPSIA, 38 AUTOPSIES

	NO. OF CASES	
Normal		7
Congestion		10
Hypostatic	3	
With pleural adhesions	2	
Edema		6
Not marked and localized	5	
Marked	1	
Edema and congestion		8
Marked	6	
Parenchymatous degeneration		1
Petechial hemorrhages		1
Bronchopneumonia hypostatic		2
Localized pulmonary tuberculosis		2
Anthraxis		1

TABLE VI. BRAIN IN ECLAMPSIA, 16 AUTOPSIES

	NO. OF CASES	PERCENTAGE
Not examined	23	
Examined	16	
Normal	7	45
Congestion	6	(of examined cases)
Edema	2	
Meningeal hemorrhage	1	

TABLE VII. SPLEEN IN ECLAMPSIA, 38 AUTOPSIES

	NO. OF CASES
Normal	18
Congestion	8
Petechial hemorrhages	4
Small and soft	4
Slightly enlarged	3
Splenomegaly (1207 grams)	1

in three cases of fatty degeneration, and in one case of focal necrosis. In one case the central area alone was affected, in another the portal area, most markedly, and the central areas were the sites of necrosis. In the rest of the cases the focal necroses were indistinctly scattered in the liver lobule without predilection for any particular zone. Our findings therefore fail to confirm the prevalent view that focal necrosis around the portal areas is a frequent if not the constant lesion found in eclampsia. They agree more to the view of Bell,⁷ Levy-Solal⁸ and Tzanck⁹ in that the hemorrhagic, fatty and degenerative changes in the liver do not always choose the portal areas but may affect any part of the lobule. In some cases the necrosis was found more around the central vein, and in others, in the midzonal areas. However there is a distinct predisposition of the subcapsular regions and the right lobe to be affected more than the rest of the liver. This was also noticed by Dieckmann⁹ who attributes it to the fact that the blood current in the portal circulation from the stomach, duodenum and jejunum goes to the right lobe, an observation made by Copher and Dick.¹⁰

TABLE VIII. PANCREAS IN ECLAMPSIA, 38 AUTOPSIES

	NO. OF CASES
Normal	21
Pale	2
Congested	4
Edema	1

TABLE IX. ADRENALS IN ECLAMPSIA, 38 AUTOPSIES

	NO. OF CASES
Normal	28
Congested	4
Pale	2
With increased pigmentation	3
With punctate hemorrhages	1

TABLE X. URINARY BLADDER IN ECLAMPSIA, 38 AUTOPSIES

	NO. OF CASES
Normal	23
Congestion	3
Punctate hemorrhages	1
Edema	1

Kidneys.—The changes found were for the most part degenerative in character in the region of the convoluted tubules. While in six cases there were marked kidney lesions in the form of acute glomerulonephritis, pyelonephritis and extensive parenchymatous degeneration, in the remaining number the kidney lesions were not so marked as to justify death. It is interesting to note that in fifteen or 36.4 per cent of the cases, chronic nephritis was the lesion found and in only three of these was the chronic affection attended by an acute or subacute process. In two cases the lesion found was only a slight chronic interstitial nephritis. All the cases with chronic nephritis were attended by the characteristic hemorrhagic focal necrosis of the liver, and in one of them, the hemorrhagic patches throughout the liver measured 1 to 2 cm. long and 0.51 cm. wide. I have diagnosed these cases presenting chronic lesions in the kidneys as eclampsia superimposed on chronic nephritis, a classification already given by Williams.

The large percentage (38.46) of attendant chronic nephritis, exhibiting at the same time liver lesions common in eclampsia and with death from "clinical" eclampsia, coupled with the observation that cases of marked nephritis had not shown eclamptic symptoms and either terminated in slow recovery or in death, where at autopsy the kidneys were found to be greatly damaged while the liver was not altered, forces us to the conclusion that eclampsia is an acute affection, not directly arising from faulty kidneys, but independently of them, which when it attacks a patient with some kidney affection, aggravates the prognosis.

Heart.—Apparently the heart is not as frequently affected as even the lungs, for it was normal in thirteen, or 33.33 per cent of the cases.

It was pale and soft in six cases and congested in two. The lesions found in the rest of the cases varied from fatty degeneration to myocardial degeneration (5 cases each). In three cases petechial hemorrhages were also found. In another three cases there was hypertrophy and in still another, dilatation. The main findings were fatty or degenerative changes and a tendency to petechial hemorrhages.

Lungs.—The lungs were apparently normal in 8, or 21 per cent of the patients. Slight congestion was found in 10 patients, edema in 6, congestion and edema in 7, petechial hemorrhages in 1 patient and parenchymatous degeneration in another patient. Bronchopneumonia was also found in 2 and localized pulmonary tuberculosis in 2 patients. From the above it can be seen that there is no characteristic lung lesion to speak of in eclampsia. Doubtless however the congestion and edema play an important rôle in the mortality when present.

Brain.—The brain was examined in only 16 cases, and it was found to be normal in seven patients, or 45 per cent. There was congestion in 6 patients, edema in two, and meningeal hemorrhage in 1 patient.

Changes in Other Organs.—The spleen, pancreas, adrenals and urinary bladder were normal respectively in 50, 55, 74, and 60 per cent of the cases. The only changes found in those affected were slight pallor, slight edema or slight congestion. Punctate hemorrhages were found in the adrenals in one patient, and in the urinary bladder in another patient.

The above findings show that the main organs affected in eclampsia are the liver, kidneys, heart, lungs, and brain with a great predominance of the liver and the kidneys, and the striking changes found in the majority of cases are, especially in the liver capillary hemorrhages and focal degeneration of the parenchyma cells.

It is generally conceded that the liver is the organ mainly affected in eclampsia but there is a divided opinion as to whether the hepatic lesion is "post hoc" or "propter hoc." Stander¹² believes that it develops early in the disease. Dieckmann⁹ claims that a sudden production of a marked liver lesion might precipitate the attack of eclampsia. Titus¹³ says it is not quite clear whether the liver involvement precedes or results from the toxemia.

Is the liver injury which necessarily impairs the liver function the primary cause of eclamptic symptoms or is there a common cause for both the symptoms and the organic lesions?

Perhaps the following observations may throw some light on this mooted question.

Among these 38 cases studied, in 34 or 89.4 per cent, it was found that there was parallelism between the severity of the symptoms and the autopsy findings. In two patients, however, who had severe clinical eclampsia with frequent convulsions rapidly followed by deep coma, high fever and rapid pulse, it was a great surprise to find at

autopsy only slight cloudy swelling of the liver and kidneys. There were no hemorrhagic spots in any organ. In one there was bilateral pulmonary edema, and in another slight pulmonary edema in the middle lobe and slight congestion in the lateral lobes. Both were primipara and both had the disease at the ninth month of pregnancy. One died undelivered and the other, a mother of twins, succumbed fifteen hours after cesarean section was performed without anesthesia. We believe that in this case life was prolonged a few hours after the abdominal delivery. No doubt the pulmonary edema in both cases contributed to the fatal end. But why the severe symptoms with no more liver or kidney lesion than a slight cloudy swelling? These two cases would seem to indicate that the eclamptic symptoms are not caused by the hemorrhagic liver lesions and that death may occur even without much liver or kidney injury. This must be correlated with the well-known fact that recovery in eclampsia is rapid and complete. It may be, though impossible to prove, that the cases that recover do not have much liver injury as is frequently seen at autopsy.

While I do not wish for the present to delve into the much discussed etiology of eclampsia, still it may be pertinent to note that death from eclampsia may occur without demonstrable pathologic lesions in the liver, kidneys, heart, or brain to justify the severity of the symptoms, and the rapid and complete recovery of an eclamptic case when it does not end fatally, in contradistinction with the slow uncertain relative recovery of a nephritic patient. This may have some bearing on the etiology of the disease. It seems to point out that the liver lesions and other acute organic lesions and the convulsions in eclampsia are primarily the result of a common origin, presumably a toxin or an altered blood condition and that provided the cause be removed or be rendered inactive in the early stages, recovery follows. On the other hand, the continuation of the anomalous state in the circulation produces not only the eclamptic symptoms but also the organic lesions notably found in the liver and kidneys.

While the two above-cited cases of severe clinical eclampsia presented only slight cloudy swelling of the liver and kidneys, one case presented the reverse of the picture. This patient died during the pregnancy with no symptoms of convulsion or unconsciousness except stiffness and cyanosis a few seconds before death. There was no edema but the patient was well nourished and entered the hospital in labor on account of intermittent bleeding due to placenta previa. On admission, the temperature was 37° C., pulse 82, and respiration 20. The blood pressure was 107 systolic. There was no history of visual disturbances nor of headache. After rupturing the membranes, $\frac{1}{4}$ c.c. of pituitrin was injected. Five minutes afterward, she became rigid and cyanosed with frothing at the mouth. The pulse became then filiform, the respiration irregular, and death rapidly supervened. At the autopsy there were found extensive hemorrhagic necrosis of the liver and marked parenchymatous degeneration of the visceral organs. There were many petechial hemorrhages in the endocardium. The pathologic diagnosis was eclampsia.

If the rapid death in this case is to be attributed to the hemorrhagic necrosis of the liver which must have taken place quickly, is it not also equally possible that the causative agent, whether it is a specific toxin or a toxic blood condition due to faulty metabolism, was produced at such an excessive amount that it paralyzed the bulbar center at the same time that it worked havoc in the organs, principally the liver?

Apparently, the *modus operandi* of what we shall call here as eclampsia toxin for want of a better term is first stimulation and irritation of the bulbar center of the nervous system producing all the nervous phenomena of eclampsia such as high blood pressure, headache, convulsions, etc. The bulbar center may be so sensitive that a certain amount of toxin may be strong enough to paralyze it without causing organic lesions in the heart, liver and kidneys at least. For the majority of cases however, the organic lesions take place when symptoms become severe. An excessive amount of toxin may quickly paralyze the bulbar center and may at the same time cause extensive organic lesions in the different organs, especially the liver. In this way clinically unrecognized cases of eclampsia or rather the convulsionless form succumb to a rapid death.

SUMMARY

1. Of 38 autopsies made of patients dying from eclampsia, 38.4 per cent exhibited chronic nephritic lesion besides focal hemorrhagic necrosis of the liver.

2. Eclampsia superimposed on a chronic nephritis has a more serious prognosis than an uncomplicated eclampsia.

3. There is a high incidence of primiparity in eclampsia ($4\frac{3}{4}$ to 1 multipara) among women without chronic nephritis but this incidence becomes relatively lower ($1\frac{1}{3}$ primipara to 1 multipara) among women suffering from chronic nephritis.

4. Focal areas of hemorrhagic necrosis and fatty degeneration predominately in the periphery of the liver lobule were observed only in a few cases, the liver lesions were rather scattered indistinctly in the lobule with special susceptibility of the central areas.

5. The correlation of the fact that eclampsia ending in recovery usually does so rapidly and completely within the limit of puerperium in contradistinction with the slow and relative recovery of nephritic toxemia, where the kidneys are definitely known to be organically involved, and the observation that severe clinical eclampsia may occur without alteration of the liver and kidneys except only cloudy swelling, seem to prove that a liver lesion, even to the extent of hemorrhagic necrosis or fatty degeneration is not the cause but rather the result of eclampsia.

6. Rapid death from a convulsion-free form of eclampsia coming on

suddenly is possible and is perhaps due to a sudden overwhelming toxemia which at the same time may produce severe organic lesions.

Acknowledgment is hereby made to the different members of the Pathological Department of the University of the Philippines who performed the autopsies. Thanks are specially due to Chief Dr. Liborio Gomez for his courtesies and valuable help in the examination of the microscopic slides.

REFERENCES

- (1) *Acosta-Sison, H., and Baens, A.*: J. Philippine Islands M. A. March, 1930. (2) *Pelliet* quoted from *Stander*. (3) *Schmorl*. (4) *Williams, J. W.*: J. A. M. A. Feb. 12, 1927. (5) *Opie*, quoted from *Stander*. (6) *Fahr*, quoted from *Stander*. (7) *Bell*, quoted from *Stander*. (8) *Levy: Solal and Tzanck*: quoted from *Stander*. (9) *Dieckmann*: AM. J. OBST. & GYNEC. 18: 6, 1929. (10) *Copher and Dick*, quoted by *Dieckmann*. (11) *Williams, J. W.*, quoted from *Stander*. (12) *Stander, H. J.*: Medicine 8: 1, 1929. (13) *Titus, P.*: AM. J. OBST. & GYNEC. 3: 2 and 5, 1922.

1002 TAFT AVENUE.

Candela, Nicolo: Accumulation of Blood, Reflexed from the Uterus, Into the Peritoneum. A Contribution to the Etiology of Endometrioma. Ann. di ostet. 51: 1501, 1929.

The author describes a case of hemoperitoneum due to blood passing through the tubes from the uterus, because of a submucous fibroma, and enumerates the various causes which might lead to an accumulation of blood in the peritoneal cavity. He tries to show that the theory of Sampson on the genesis of endometrioma, cannot be considered audacious and far-fetched, but rather is easily comprehensible in view of the relative ease and frequency of passage of blood from the uterus into the abdominal cavity.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Holland, Wilbur W.: Primary Carcinoma of the Fallopian Tubes. Surg. Gynec. Obst. 51: 683, 1930.

In this review of 386 recorded cases, report of 9 new cases and study of 10,000 removed tubes, the author shows that there is noticeable a gradual increase in the occurrence of primary carcinoma of the fallopian tubes. Inflammatory changes in tubes do not deserve the etiologic significance attributed to them by many writers. The proper diagnosis of carcinoma of the tubes can be arrived at only by macroscopic and microscopic examination. Papillary alveolar and alveolar types represent advanced stages of primary papillary malignancy.

WM. C. HENSKE.

THE INCIDENCE, DIAGNOSIS AND TREATMENT OF FUNCTIONAL STERILITY*

BY CHARLES MAZER, M.D., F.A.C.S., AND ISAAC ANDRUSSIER, M.D.,
PHILADELPHIA, PA.

(From the Department of Gynecology of the Mt. Sinai Hospital)

IT MAY be said without contradiction that the study of sterility in the female requires a more thorough understanding of the physiology and pathology of the generative and associated organs than any other gynecologic condition. This pertains, especially, to the study of functional sterility.

It is equally true that from a remunerative standpoint, the time-consuming and painstaking search for the underlying cause and its successful treatment is sadly disappointing. Few of these patients are able or willing to pay for the tremendous amount of clinical and laboratory studies necessary in the diagnosis of these cases, especially when the hope for an ultimate cure with the limited means at our disposal is so uncertain. For this reason, few gynecologists have given this problem, which is of great social importance, their serious thought. Most hospitals are busily engaged in the relief of the physical afflictions of mankind and are unprepared to render the necessary service to the numerous women who suffer from the mental agony of infertility.

Involuntary sterility is on the increase in all civilized countries. Its incidence in this country is placed at 13 per cent by Reynolds and Macomber.¹ Lotka² places the gross sterility of the American white population at 17 per cent. A condition so prevalent certainly deserves our serious attention. The relief of sterility due to organic conditions of the generative tract is largely a matter of sex hygiene and eugenics, but functional sterility in the female is beyond the scope of prophylaxis; it is largely a product of civilization.

In a previous study of 506 cases of female sterility,³ we found that endocrine malfunction was the responsible factor in 25 per cent. Our present study is limited to a group of 103 sterile women in whom patency of the fallopian tubes was established by means of the Rubin test; other organic conditions of the generative tract, except hypoplasia, were eliminated. Fertility of their mates was established by means of the Hühner test alone or combined with an examination of the condom specimen. In 22 of these women, we found persistently dead spermatozoa in the cervical secretions and vaginal pool several

*Read before a Meeting of the Obstetrical Society of Philadelphia, November 6, 1930.

hours after coitus, though the condom specimens showed numerous actively motile spermatozoa. This finding, in the absence of cervical infection, argues for the existence of a biologic incompatibility between the cervical secretions and the spermatozoa of their respective mates. What rôle endocrine deficiency plays in the production of such incompatibility is still a matter for investigation.

In order to understand the factors involved in the etiology of functional sterility, we must review briefly the physiology of the female generative organs in the light of recent developments in the study of sex endocrinology. Hitschmann and Adler⁴ were the first to observe the cyclic endometrial changes occurring in the human female. The dependence of the rhythmic endometrial changes upon simultaneous evolutionary phenomena in the ovary was first noted by Schröder.⁵ These observations were not clearly understood until the comparatively recent work of Frank,⁶ and Allen⁷ on the hormone of the graafian follicle; Weichert,⁸ Hisaw,⁹ and Corner¹⁰ on the lutein hormone of the corpus luteum; and Zondek and Aschheim,¹¹ and Smith¹² on the sex hormone of the anterior pituitary gland.

The result of their extensive experimental studies which were confirmed by others, too numerous to mention, may be summarized as follows:

The sex hormone (or hormones) of the anterior pituitary gland is the motor of ovarian function. Hypophysectomy causes degeneration of the animal ovaries and abolition of all sex functions. Anterior pituitary transplants into the hypophysectomized animal results in complete restitution of ovarian function (Smith¹³). Reactivation of sex function in senile and sexually unfit animals by means of anterior pituitary transplants was observed by Zondek and Aschheim.¹⁴ We obtained the same effects by treating senile animals with the blood serum or urine of pregnant women. Senile female white mice were kept under observation in the laboratory for two months, during which time they showed no evidence of estrus. A unilateral oophorectomy was then performed on a number of these animals and 10 c.c. of blood serum or urine of pregnant women, in divided doses, were injected into each of the animals in the course of two days. At the end of four days, most of them became estrous and showed phenomenal reactivation of the remaining ovary as compared with the control. Serial sections of the ovaries showed maturation of graafian follicles and formation of corpora lutea. Animals which were not killed at the end of four days were repeatedly brought into estrus by means of these injections.

The blood and urine of pregnant women contain large quantities of female sex and anterior pituitary hormones. The former has no influence on the ovaries, though it can bring a senile or an infantile animal into a state of estrus. The ovaries, however, of the animals thus

treated remain unaffected. The pituitary hormone, on the other hand, exerts its influence solely upon the ovaries; the female sex hormone elaborated by the maturing graafian follicles, as a result of this influence, produces changes in the lower genital tract characterized as estrus.

Infantile animals can be brought into a state of sexual maturity by means of anterior pituitary implants and potent extracts thereof (Zondek¹⁵). The maturing graafian follicle elaborates female sex hormone which produces growth and vascularization of the uterus and cornification of the vaginal epithelium, as evidenced by the vaginal smear. At this phase of the sexual cycle, the endometrium of the animal is still of an interval type. Through the continued stimulation by the anterior pituitary hormone the graafian follicles are transformed into corpora lutea. The latter produce in addition to female sex hormone an even more important principle, namely, lutein hormone which prepares the endometrium for nidation and inhibits further development of graafian follicles (Papanicolaou,¹⁶ and Corner and Allen¹⁰). In other words, the uterus is brought into a pregravid state, preparatory to the reception of the fertilized ovum, through the influence of the corpus luteum hormone. Without a progestational endometrium, imbedment of a fertilized ovum is impossible. Failure of fertilization results in regressive changes in the corpus luteum and consequent dismantling of the bridal bed which, through the medium of the lutein hormone, nature prepares in anticipation of a fertilized ovum. What causes the withdrawal of the hormonal influence of the anterior pituitary gland upon the corpus luteum when fertilization is not accomplished is, as yet, unknown.

At this juncture, it may not be amiss to say a word concerning the reported "antagonism of growth and sex hormones" of the anterior hypophysis (Evans and Simpson¹⁷). It was thought that the growth hormone from the anterior pituitary lobe has an inhibitory action on ovulation and estrus through the rapid luteinization of maturing follicles before ovulation could occur. It was later shown by Wiesner and Crew¹⁸ that the anterior pituitary growth extract of Evans and Simpson is composed of two distinct hormones: (a) a growth hormone capable of producing gigantism in the animal; (b) a luteinization hormone.

Zondek,¹⁵ and Wiesner and Crew¹⁸ maintain that the anterior pituitary gland produces two sex hormones: (a) a follicle maturing hormone; (b) a luteinization hormone. This, however, is still an unsettled matter. The fact is that repeated implantations of anterior pituitary lobe or injections of excessive amounts of blood or urine of pregnant women produce a state of hyperluteinization in the ovaries of the test animal. In the overtreated animals, the granulosa cells of the maturing graafian follicles are converted into lutein tissue

before ovulation and estrus occur, causing an arrest of the ovum in the hyperluteinized tissue. The lutein hormone elaborated by the luteinized follicles, in a sense, is antagonistic to female sex hormone produced by the graafian follicle. It inhibits further ovulation and estrus in the course of preparing the generative organs for the reception of a fertilized ovum. In the uterus, it produces a progestational endometrium; in the vagina, it produces mucification of the epithelium analogous to the condition found in the pregnant animal.

THE OCCURRENCE OF PSEUDOMENSTRUATION IN THE MONKEY

The study of the *Macacus rhesus*, which duplicates the cycle of the human female in time, periodicity and the occurrence of actual bleeding, has given us invaluable information concerning the physiology of the human generative organs. Corner¹⁹ has shown that some of these animals menstruate without previous ovulation or formation of corpora lutea. Moreover, he observed that such cyclic uterine bleeding is never associated with a premenstrual endometrium, the bleeding being a sort of diapedesis from an interval endometrium. Where a corpus luteum was found at the onset of menstruation, the presence of a premenstrual endometrium was invariably evident. He thus corroborated the findings of others that the corpus luteum hormone is essential in the preparation of a premenstrual endometrium and, what is more important, is his proof that menstruation is not necessarily the result of ovulation and corpus luteum formation. This anovular menstruation of the *Macacus rhesus* may be called pseudomenstruation.

Its occurrence in the human female was suggested by Schröder²⁰ but has not yet been proved. We have, however, considerable clinical evidence justifying our belief in its existence. Many of us observed in the course of abdominal operations on regularly menstruating women, who were either at the tail end of the menstrual cycle or actually menstruating, the total absence of a recent or old corpus luteum. Thus, a careful observer like Allen²¹ says: "In one or two cases the evidence clearly points to absence of ovulation in the last several cycles. This condition, menstruation without ovulation, so common in the monkey, must be recognized as occurring in women."

CLASSIFICATION OF STERILITY

Child's²² classification of female sterility is complete and comprehensive. Primary sterility denotes that a woman has never conceived. Secondary sterility includes those cases where the woman has borne one or more children and has become sterile thereafter. Relative sterility embraces those cases where conception has taken place but resulted in early death of the fetus or in the birth of a nonviable child.

Of the 103 cases herein reported, 77 were primary, 15 secondary, and 11 relative sterility. The term "functional sterility," herein employed, designates those women who have remained involuntarily sterile for a period of three or more years; who presented stigmas of endocrine malfunction and in whom no organic condition was found to account for the existing sterility. Those presenting metabolic faults of extrinsic origin or debility due to a constitutional condition were not included in this study. Etiologically, they were classified into primary pituitary, ovarian, and thyroid malfunction. Twenty-three of this group, though presenting unmistakable evidence of endocrine malfunction, could not be classified into one of the three groups because of lack of clinical and laboratory evidence indicative of the particular gland involved.

TABLE I. CLASSIFICATION AS TO THE TYPE OF STERILITY AND APPARENT CAUSE

	PRIMARY	SECONDARY	RELATIVE	TOTAL
Pituitary	51	7	3	61
Ovarian	8	3	4	15
Thyroid	3	1	0	4
Unclassified	15	4	4	23
	<hr/> 77	<hr/> 15	<hr/> 11	<hr/> 103

CLASSIFICATION OF STERILITY AS TO ETIOLOGY

Primary Ovarian Hypofunction.—The existence of primary ovarian hypofunction in the noneastrated female is denied by some dependable observers who maintain that ovarian failure is invariably secondary to anterior pituitary malfunction. Others, equally competent, draw a sharp line of demarcation between primary and secondary ovarian failure. No single finding in the differential diagnosis between the two conditions is of greater significance than the presence of a demonstrable quantity of anterior pituitary hormone in the circulating blood. It at once eliminates hypofunction of the anterior pituitary lobe as the causal agent since, as Fluhmann²⁵ has shown, normal fertile women and, naturally, those suffering from failure of the anterior pituitary lobe rarely, if ever, show a demonstrable quantity of the hormone except during pregnancy.

It was shown by Tandler and Grosz,²⁶ and others, that the anterior pituitary gland hypertrophies after castration. Fluhmann²⁵ found a demonstrable quantity of anterior pituitary sex hormone in the blood of castrated women and in those in whom the natural menopause is well established. We found a demonstrable quantity of the hormone in 8 of 15 women who were classified as cases of primary ovarian failure because of stigmas and laboratory findings characteristic of the condition. This finding, in our opinion, is pathognomonic of primary ovarian deficiency. These women are either of the old-maid type

(eunuchoid) or superlatively feminine. Hair distribution is either normal or scanty. They are either of average weight or thin, rarely stout. They are usually self-centered, emotional and critical of environmental conditions. Hypoplasia of the generative organs is almost invariably found in these women. Menstrual irregularity or amenorrhea is present in over 50 per cent. The female sex hormone level is naturally low.

Primary Pituitary Malfunction.—The inadequacy of a single observation to establish a diagnosis of malfunction of a given endocrine gland is apparent. The importance of eliminating as a causative factor nonendocrine conditions, such as systemic diseases, is also apparent. It is hardly necessary to reiterate that the anterior pituitary gland is the primary source of ovarian function and that alteration in its activity almost invariably reflects upon the structure and function of the ovaries.

In addition to genital hypoplasia and menstrual derangements, these women present unmistakable evidence of pituitary hypofunction. They are usually stout. The deposit of adipose tissue shows a rather characteristic distribution. They possess a male distribution of pubic hair and an excess of hair in other localities. They lack the eccentricity and nervous instability of the ovarian type. Their sugar tolerance is usually increased because of an associated hypofunction of the posterior pituitary lobe. This test is of great value in the diagnosis of anterior pituitary failure when properly performed and verified.

In skilled hands, the eye examination, in this class of women, is more informative than any other single observation. Contraction of the visual fields, yellow color of the discs and enlargement of the blind spots point to pituitary malfunction. The size and shape of the sella turcica, as shown by x-ray studies, is of little value in the diagnosis of pituitary malfunction unless there is actual erosion of the clinoids, which is seen only in pronounced cases of pituitary hyperplasia. The level of female sex hormone is low in these cases and is of no value in the differential diagnosis between this condition and primary ovarian failure. A demonstrable quantity of anterior pituitary sex hormone was not found in any of the 43 cases studied (see Table IV). This is in contrast to the finding of a demonstrable quantity of this hormone in 8 of 15 cases of primary ovarian hypofunction.

Thyroid Hypofunction.—Thyroid hypofunction as the responsible agent was observed in only 4 of 103 cases presented in this report. The diagnosis is relatively easy if one resorts to the basal metabolism test, routinely, in the study of functional sterility.

Types of Menstruation.—Sterile women who show evidence of genital hypoplasia and other stigmas of endocrine malfunction, though

menstruating regularly, must be included in the functional sterility class. Thirty-seven in this series presented no apparent derangements of menstruation. Thirty-four menstruated at intervals of three or more months; these we term amenorrheic. Twenty-seven have had intervals of less than three months, hence the term oligomenorrhea. Those who menstruate regularly but scantily are termed hypomenorrheic; of these we have 5 in this series.

TABLE II. CLASSIFICATION AS TO APPARENT ETIOLOGY AND TYPE OF MENSTRUATION

	NORMAL	AMENOR- RHEA	OLIGOMEN- ORRHEA	HYPOMEN- ORRHEA	TOTAL
Pituitary deficiency	17	25	16	3	61
Primary ovarian deficiency	5	5	5	0	15
Thyroid deficiency	1	0	3	0	4
Unclassified	14	4	3	2	23
Total	37	34	27	5	103

Functional Sterility in Regularly Menstruating Women.—Amenorrheic and irregularly menstruating sterile women are unquestionably of low fertility. The female sex hormone test is of no diagnostic value in this class of patients. They rarely show a normal level of female sex hormone in the blood at a time when 94 per cent of normal fertile women show a demonstrable quantity of the hormone.

Regularly menstruating sterile women present a problem in diagnosis. Failure to obtain a demonstrable quantity of female sex hormone from their blood a day or two before the expected onset of the flow is, in our experience, indicative of ovarian hypofunction, either primary or secondary to anterior pituitary failure. To render this test more reliable, we abstract 80 c.c. of venous blood for the simultaneous use of two animals to provide against inherent resistance of one of the two animals to the stimulating effect of the female sex hormone contained in the patient's blood. Employing a duplicate test for female sex hormone, we have obtained a positive reaction in 64 of 68 normal fertile women. In the group of 37 regularly menstruating sterile women, 22 showed no demonstrable quantity of female sex hormone; 8 exhibited a threshold quantity; and only 7 showed a normal level.

Fourteen of this group could not be classified as to the particular gland involved. It is fair to assume that some of these who showed a normal level of female sex hormone were erroneously classified as endocrine cases.

The Occurrence of Pseudomenstruation in the Human.—Of even greater diagnostic value in this group of cases is the failure to recover a premenstrual endometrium by means of the curette a day or two before the expected onset of the flow. As shown in Table III, only 17 of the 37 women subjected to curettage a day or two before the

onset of the expected flow showed a perfectly normal premenstrual endometrium. Four showed a premenstrual endometrium with local hyperplasia; 1 an atrophic endometrium, and 5 a hyperplastic endometrium; the remaining 10 showed an interval endometrium. The correlation between an improperly prepared endometrium and the lack of female sex hormone in the blood is well illustrated in Table III.

TABLE III. (GROUP 1). FUNCTIONAL STERILITY IN REGULARLY MENSTRUATING WOMEN. RELATIONSHIP BETWEEN THE CONDITION OF THE ENDOMETRIUM AND THE LEVEL OF FEMALE SEX HORMONE

	FEMALE SEX HORMONE LEVEL			TOTAL
	NORMAL	THRESHOLD	NEGATIVE	
Interval endometrium	0	1	9	10
Hyperplasia	1	1	3	5
Atrophic endometrium	0	0	1	1
Premenstrual endometrium with local hyperplasia	0	0	4	4
Premenstrual	6	6	5	17
Total	7	8	22	37

In this group only a few were tested for the presence of anterior pituitary hormone in the blood.

Clinically, these cases were classified as follows: pituitary 17; ovarian 5; thyroid 1; unclassified 14.

Of the 20 presenting some abnormality of the endometrium only 3 showed a demonstrable quantity of female sex hormone in the blood a day or two before the onset of menstruation.

In the light of Corner's findings in the monkey and the clinical observations cited above, there is reason to believe that 16 of the 37 women subjected to a premenstrual curettage were subject to anovular menstruation or pseudomenstruation. It was shown by Robertson²³ that cyclic uterine bleeding can be induced in the castrated monkey by the sudden withdrawal of female sex hormone injections. Such uterine bleeding is, however, never accompanied by shedding of a premenstrual endometrium unless the preparatory treatment with female sex hormone is followed by injections of lutein hormone (Corner and Allen¹⁹). These observations on the *Macacus rhesus* help us to explain the absence of a premenstrual endometrium and the low level of female sex hormone in some of this group of women.

It is to be remembered that the corpus luteum continues the production of female sex hormone initiated by the maturing graafian follicle; simultaneously, it produces lutein hormone which is essential in the preparation of the premenstrual endometrium. It is the failure of ovulation and of the formation of a corpus luteum which results in the absence of a premenstrual endometrium and the low blood level of female sex hormone a day or two before the expected flow.

While the existence of anovular menstruation in some of these women cannot be proved without recourse to a laparotomy at the

onset of the menstrual flow, its existence, we believe, is a fair assumption. The follicle which fails to rupture, either through lack of hormonal stimulation from the anterior pituitary gland or inherent lack of vitality, undergoes cystic atresia so well described by Macomber²⁴ a year ago before this society. The cystic ovaries are usually the result of endocrine malfunction and not the primary cause of an existing functional sterility.

TABLE IV. (GROUP 2). FUNCTIONAL STERILITY ASSOCIATED WITH AMENORRHEA OR OLIGOMENORRHEA AND THE BLOOD HORMONE FINDINGS

	FEMALE SEX HORMONE LEVEL			PITUITARY HORMONE		
	NORMAL	THRESHOLD	NEG.	POS.	NEG.	TOTAL
Pituitary cases	5	4	34	0	43	43
Primary ovarian cases	0	2	8	8	2	10
Thyroid cases	0	1	3	Not obtained		4
Unclassified	2	1	6	0	9	9
Total	7	8	51	8	54	66

Functional Sterility Associated With Menstrual Derangements.—Of the 66 women in this group, 43 presented unmistakable evidence of pituitary hypofunction; 10 showed evidence of primary ovarian hypofunction; 4 were thyroid in type; and 9 remained unclassified. The correlation between menstrual derangements and the lack of a demonstrable quantity of female sex hormone is illustrated in Table IV.

Of the entire group of 66, only 15 showed either a normal or a threshold quantity of female sex hormone. This is in sharp contrast with the positive reaction obtained in 94 per cent of normal fertile women.

TABLE V. DIFFERENTIAL DIAGNOSIS OF ENDOCRINE STERILITY

	PITUITARY	OVARIAN	THYROID
Hypoplasia of generative organs	Marked	Marked	Moderate or absent
Menstrual derangements	Prolonged interval; scanty flow	Prolonged interval; scanty flow	Irregularity; menorrhagia
Obesity	Common; abnormal distribution of fat	Not common; usually underweight	Common; distribution is uniform
Amount and distribution of hair	Profuse; male distribution common	Normal or scanty; male distribution rare	Normal
Thyroid enlargement	Rare	Rare	Frequent
Kidney function	Impaired in some	Normal	Normal
Eye findings	Frequently abnormal	Normal	Normal
Sugar tolerance	Increased	Decreased	Normal
Basal metabolism	Lowered	Lowered	Very low
Female sex hormone	Low	Low	Low
Pituitary hormone	Not demonstrable	Demonstrable in over 50 per cent	Not known

Treatment of Functional Sterility.—Restoration of menstrual periodicity is important, but not essential. The term "normal menstruation" is employed in its literal sense, signifying the cyclic shedding

of a premenstrual endometrium and not merely uterine bleeding from an interval or hyperplastic endometrium. One of the amenorrheic women in this series who responded to organotherapy and other measures showed an interval endometrium when curetted a day before the expected onset of the menstrual flow. After periods of amenorrhea ranging from three to six months, she menstruated regularly for five consecutive months when the exploratory curettage was performed. Since then she has continued to menstruate regularly but at no time were we able to recover a demonstrable quantity of female sex hormone in her blood. We are convinced that the presence of a mouse unit of female sex hormone in 40 c.c. of blood, a few days before the expected cycle, is sufficient evidence of the presence of a functioning corpus luteum which is the only source of the hormone at this phase of the menstrual cycle. If the corpus luteum is producing a sufficient quantity of female sex hormone, it is reasonable to assume that it also produces lutein hormone which is essential in the preparation of the premenstrual endometrium. It is, therefore, unnecessary to curette these women for diagnostic purposes. The absence of a demonstrable quantity of female sex hormone (a duplicate test must be performed) a few days before the expected onset of menstruation in regularly menstruating sterile women may reasonably be taken as evidence that a normal corpus luteum has not developed and consequently that there is an absence of a properly prepared endometrium.

The thick hyperplastic endometrium so often found in irregularly menstruating women is the result of continued ovarian hypofunction, either primary or secondary to malfunction of the anterior pituitary gland. Its removal by means of the curette is sometimes followed by pregnancy without improvement in the menstrual rhythm.

Removal of foci of infection, especially in the group of relative sterility, is of utmost importance. The correction of a faulty diet deficient in vitamin E is equally important.

X-ray Treatment in Functional Sterility.—We obtained better results with x-ray stimulation of the ovaries and pituitary gland than with any other form of treatment. Six of the 38 sterile women with menstrual derangements, thus treated, were delivered of healthy offspring; 19 or 50 per cent are menstruating regularly; and 7 show

TABLE VI. RESULTS OF X-RAY TREATMENT IN FUNCTIONAL STERILITY ASSOCIATED WITH DERANGEMENTS OF MENSTRUATION

Normal menstruation reestablished (of these 6 carried to term)	19
Improvement in menstruation	7
No improvement	10
Made worse	2
	—
Total	38

marked improvement in the menstrual rhythm. The remaining 12 were not benefited by x-ray treatment.

Primary ovarian failure, in some of which there is a compensatory hyperfunction of the anterior pituitary gland, as evidenced by the recovery of a mouse unit of anterior pituitary hormone from 6 c.c. of blood serum, should be treated by x-ray stimulation directed to the ovaries only. Irradiation of the pituitary gland in these cases is useless and probably harmful. In this series of 38 cases, only 2 were thus treated. Menstruation was reestablished in both; 1 of the 2 gave birth to a healthy infant.

In order to establish the primacy of the pituitary gland as the causative factor in the existing amenorrhea, 6 of this group received x-ray stimulation of the pituitary gland alone; of these, 3 are menstruating regularly, but thus far have not conceived; the other 3 were not benefited by the treatment. Simultaneous stimulation of the ovaries in the pituitary cases is theoretically sound.

Rubin²⁷ says: "Small doses of the latter (x-rays) applied first to the hypophysis and if necessary to the ovaries have proved successful, not only in restoring the menstrual periodicity to more nearly the normal in 80 to 90 per cent of the patients, but it has also incidentally increased their fertility to at least 50 per cent. Theoretical damage of the germ-plasm which is supposed to result from this treatment has, so far, not been demonstrated."

Drips²⁸ and others have also reported favorable results from low dosage irradiation of the ovaries or hypophysis in women with menstrual disturbances.

Irradiation of the ductless glands, if not properly applied, may do irreparable damage. Unfavorable results are due either to wrong diagnosis or faulty dosage. Where the ovaries or thyroid are primarily at fault, no effect can be obtained by irradiation of the pituitary gland, in fact, as indicated in the foregoing pages, harm may result. The tendency on the part of some roentgenologists to treat these cases without the aid of the clinician is bound to discredit the procedure.

We shall make no attempt to describe the technic of therapeutic irradiation of the ductless glands, except to note that 10 to 16 per cent of an erythema dose, given three times in the course of two weeks, has given us the best results, and that repetition of the course of treatments, in case of failure to obtain improvement, before the lapse of several months, has given us no beneficial results. On the contrary, 2 of these patients have been unfavorably affected. It is incumbent upon the roentgenologist to acquire the necessary information concerning the technic of low dosage irradiation of ductless glands before he attempts to treat these patients.

Results Obtained by Organotherapy and Other Measures in the Treatment of Functional Sterility.—Theoretically, organotherapy is purely substitutive. Clinically, there is evidence pointing to restoration of

function of the affected gland in some cases of endocrine malfunction. As a whole, organotherapy is sadly disappointing. We have at present fairly potent products of female sex hormone, but the endometrial cycle depends upon the balanced action of female sex and lutein hormones. The latter is not available for therapeutic use because of the meager source of supply. It is, therefore, apparent that the administration of female sex hormone alone may produce, at best, a pseudomenstruation if not followed up by the administration of lutein hormone. Even oral administration of female sex hormone in the form of Progynon pills has occasionally given us an improvement in the menstrual cycle. The dosage must be controlled by examination of the urine for female sex hormone by the Allen and Doisy test. The presence of a demonstrable quantity of the hormone in 12 c.c. of urine indicates that a sufficient quantity has been administered.

None of the ampoule preparations of female sex hormone tested in our laboratory contains the number of rat units specified on the label, probably due to the instability of aqueous solutions of the hormone. They retain, however, sufficient potency to produce the necessary effect in a few cases.

The oral administration of anterior pituitary extracts in cases of functional sterility, secondary to hypofunction of the anterior hypophysis, even when administered in massive doses (50 to 60 grains, daily) has proved, in our hands, even more disappointing than the use of ovarian products in primary ovarian deficiency. We have tested a number of samples of this product by the Aschheim-Zondek test and failed to find a demonstrable quantity of anterior pituitary sex hormone in any of them. Zondek,²⁹ who obtained a potent extract (Prolan) of the anterior pituitary lobe from the urine of pregnant women, reports favorable results in the treatment of menstrual derangements by daily intramuscular administration of 200 rat units of Prolan during the first 9 days, followed by daily administration of 40 to 500 mouse units of female sex hormone during the subsequent twenty days. This is a rather costly course of treatment which few of our patients can afford. Moreover, we made repeated attempts to import Prolan without success.

TABLE VII. RESULTS OBTAINED BY ORGANOTHERAPY AND OTHER MEASURES

	REGULAR MENSTRUATING WOMEN TOTAL	AMENORRHEIC AND OLIGOMENORRHEIC WOMEN TOTAL
Delivered	3	6
Aborted	1	1
Menstruation improved	0	5
No results	33	16
Total	37	28

The administration of thyroid extract, even in those women who show no apparent deficiency of thyroid function, has apparently given us favorable results in some cases. It is, however, difficult to evaluate the efficacy of organotherapy because other measures equally important, as elimination of foci of infection, correction of diet, and hygienic measures are simultaneously employed.

In this small series of cases the 9 pregnancies in those treated with glandular extracts represents a percentage of success relatively as high as in the group of women treated by low dosage irradiation. However, the percentage of relief from menstrual derangements, through the agency of the latter, is much higher.

The low percentage of succeeding pregnancies in this series of 103 treated cases is, in our opinion, due to the inclusion of only those cases of long-standing sterility presenting definite stigmas of endocrinopathies.

SUMMARY AND CONCLUSIONS

The dependence of ovarian function upon hormonal stimulation from the anterior pituitary gland and the compensatory hyperfunction of the latter in cases of primary ovarian failure are herein emphasized.

The normal menstrual cycle depends upon the balanced activity of the two ovarian hormones; the female sex hormone generated by the graafian follicle produces growth and vascularization of the uterus, the lutein hormone generated by the corpus luteum produces premenstrual endometrial changes preparatory to the reception of a fertilized ovum.

Evidence is given that 16 of the group of 37 regularly menstruating sterile women were probably subject to anovular menstruation as shown by the simultaneous absence of a premenstrual endometrium and a demonstrable quantity of female sex hormone a day or two before the onset of the expected flow.

The Frank and Goldberger test for the blood level of female sex hormone is of great value in the diagnosis of functional sterility in regularly menstruating women, but is of little value in the diagnosis of this condition associated with menstrual derangements.

The recovery of a demonstrable quantity of anterior pituitary sex hormone from the blood of women suffering from functional sterility is pathognomonic of primary ovarian failure. Normal fertile women and those suffering from pituitary hypofunction rarely, if ever, show a demonstrable quantity of the hormone except during pregnancy.

Low dosage irradiation of the affected endocrine glands was successful in reestablishing menstrual periodicity in more than 50 per cent of 38 women thus treated; organotherapy is far less effective.

The number of succeeding pregnancies is relatively equal in the two groups treated, respectively, by x-ray stimulation and organotherapy.

REFERENCES

- (1) *Reynolds and Macomber: Fertility and Sterility*, 1924, W. B. Saunders Co., p. 32. (2) *Lotka, A. J.: Proc. Nat. Acad. Sc.* 14: 99, 1928. (3) *Mazer, C., and Hoffman, J.: M. J. & Rec.* 129: 90, 1929. (4) *Hitschmann, F., and Adler, L.: Monatschr. f. Geburtsh u. Gynäk.* 27: 1, 1908. (5) *Schröder, R.: Arch. f. Gynäk.* 101: 1-235, 1913. (6) *Frank, R. T.: AM. J. OBST. & GYNEC.* 12: 585, 1926. (7) *Allen, E., and Doisy, E. A.: J. A. M. A.* 81: 819, 1923. (8) *Weichert, C. K.: Proc. Soc. Exper. Biol. & Med.* 25: 490, 1928. (9) *Hisaw, F. L.: Physiol. Zoöl.* 2: 59, 1929. (10) *Corner, G. W., and Allen, W. M.: Am. J. Physiol.* 88: 326, 1929. (11) *Zondek, B., and Aschheim, S.: Klin. Wehnschr.* 6: 248, 1927. (12) *Smith, P. E.: Am. J. Physiol.* 80: 114, 1927. (13) *Smith, P. E.: Anat. Rec.* 32: 221, 1926. (14) *Zondek, B., and Aschheim, S.: Arch. f. Gynäk.* 130: 1, 1927. (15) *Zondek, B.: Klin. Wehnschr.* 9: 245, 1930. (16) *Papanicolaou, G. N.: J. A. M. A.* 86: 1422, 1926. (17) *Evans, H. M., and Simpson, M. E.: J. A. M. A.* 91: 1337, 1928. (18) *Wiesner, B. P., and Crew, F. A. E.: Pro. Royal Soc. Edinburgh* 50: 79, 1929-30. (19) *Corner, G. W.: Contrib. Embryol.* 15: 75, 1923. (20) *Schröder, R.: AM. J. OBST. & GYNEC.* 16: 155, 1928. (21) *Allen, E., Pratt, J. P., Newell, Q. U., and Bland, L.: J. A. M. A.* 91: 1018, 1928. (22) *Child, C. G.: Sterility and Conception*, 1922, Appleton & Co., p. 40. (23) *Robertson, D. C., Muddua, W. P., and Allen, E.: Endocrinology* 14: 77, 1930. (24) *Macomber, D.: AM. J. OBST. & GYNEC.* 19: 739, 1930. (25) *Fluhmann, C. F.: AM. J. OBST. & GYNEC.* 20: 1, 1930. (26) *Tandler, J., and Grosz, S.: Wien. klin. Wehnschr.* 21: 277, 1908. (27) *Rubin, I. C.: AM. J. OBST. & GYNEC.* 48: 603, 1929. (28) *Drips, D. G., and Ford, A.: J. A. M. A.* 91: 1358, 1928. (29) *Zondek, B.: Klin. Wehnschr.* 8: 2229, 1929.

1829 PINE STREET.

Molinengo: Autotransplants of Endometrium in the Peritoneum of Rabbits. *Ann. di ostet. e ginec.* 52: 309, 1930.

The author from various experiments on rabbits concludes:

In the rabbit the autoplasmic attachment of small particles of endometrium and uterine musculature in the peritoneal cavity is possible, also without any particular preparation of the scrota. The attachment may be achieved at any special point of the peritoneal scrota, whenever a proper preparation for the transplant has been made.

The attached uterine particles after further development produce papillary or cystic tumors, in which the characters of the epithelium, and the relative, muscular, and epithelial arrangement resemble the musculo-epithelial structure of the adenomyomas in woman.

The hormonal action of the ovary does not appear to have an appreciable influence on either the attachment of uterine particles or on the development of tumefactions.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

STUDY OF THE CALCIUM-PHOSPHORUS RATIO IN THE SERUM OF SYPHILITIC PREGNANT WOMEN*

BY JOSEPH V. KLAUDER, M.D., AND HERMAN BROWN, B.S.,
PHILADELPHIA, PA.

*(From the Research Institute of Cutaneous Medicine and Department of Dermatology
and Syphilology, Woman's Medical College of Pennsylvania)*

IT IS well known that calcium and phosphorus are intimately concerned in bone metabolism, that there is a disturbance of calcium and phosphorus metabolism in pregnancy, and that pathologic involvement of the osseous system is a frequent accompaniment of congenital syphilis. We are unaware of any reported studies of the osseous system in congenital syphilis which concern an investigation of the calcium-phosphorus ratio in the sera of syphilitic pregnant women.

The foregoing considerations motivated the study herein reported. Our purpose was to determine the calcium-phosphorus ratio in pregnant women infected with syphilis and to compare this with the ratios of pregnant women not infected with syphilis, and nonpregnant women, with and without syphilitic infection.

Accordingly, the calcium and phosphorus were determined in the sera of about ten patients in each of the four groups, a total of 46 different patients. The majority were white, all were within the childbearing period excepting 3 patients who were around fifty years of age. In the pregnant women group, of 24 patients studied, 16 were in the seventh, eighth or ninth month of pregnancy; 5 were in the sixth month and the remaining 3 were in the third and fifth months. The pregnancy was normal in this group.†

In the syphilitic group, the sera of all patients yielded a 4-plus Wassermann reaction. Patients who were pregnant and infected with syphilis, presented no clinical manifestations of syphilis. From the history, the infection was apparently of long duration; the majority were previously untreated.

In the group not infected with syphilis, the sera of the patients yielded a negative reaction, and there was no reason to suspect a syphilitic infection.

METHODS EMPLOYED FOR DETERMINATIONS OF CALCIUM AND PHOSPHORUS. NORMAL VALUES FOR TOTAL SERUM CALCIUM AND PHOSPHORUS

Determinations of calcium were made according to Tisdall's modification¹ of Kramer and Tisdall's method. Determinations of phos-

*Read at a Meeting of the Obstetrical Society of Philadelphia, November 6, 1930.

†These were ward patients in the service of Dr. Lida Stewart Cogill at the Woman's College Hospital.

phorus were made according to Benedict and Theis.² Blood was withdrawn from patients on a fasting stomach. Serum was separated from the blood as soon as it was withdrawn from the vein and examined at once. In some instances the serum was left on ice and examined within twenty-four hours.

Normal values for total serum calcium were regarded as 9 to 12 mg. per 100 c.c. of serum; phosphorus, 3 to 4 mg. per 100 c.c. of serum. The normal calcium-phosphorus ratio was regarded as about 3.0.

RESULTS OF STUDY

The results are shown in Table I. It will be seen that values for calcium and phosphorus, the calcium-phosphorus ratio and calcium-phosphorus product were essentially not different in the pregnant women who were syphilitic from those women not infected with syphilis. It is to be noted, however, that patients in the pregnant women group showed low normal values for calcium, low and low normal values for phosphorus, a slightly higher ratio and lower figure for calcium-phosphorus product than the women who were not pregnant. Phosphorus values were affected more than calcium in the pregnant women group, the average figure being 2.065, compared to 3.25 in the nonpregnant women group; whereas, the average figure for calcium was 9.35, compared to 10.0 in the nonpregnant women group.

Our results pertaining to low total serum calcium values in pregnant women are consistent with studies, notably of Coons and Blunt³ and of Maey, Hunseher, Nims and McCosh,⁴ which show that in pregnant women there is a disturbance of calcium and phosphorus metabolism. Such disturbance has been observed in pregnant cows, by Forbes⁵ and his coworkers, and in pregnant rats, by Goss and Schmidt.⁶

A number of other investigators have reported low total serum calcium values in pregnant women. Bokelmann and Boek⁷ observed an average of 10.0 mg. in normal nonpregnant women; 9.6 mg., from the second to the fifth month of pregnancy; 9.4 mg., from the sixth to the tenth month; 9.7 mg., at the beginning of labor, and 9.8 mg. during the lying-in period.

In the first five months of pregnancy, the average calcium was 9.04 mg., and in the last five months, 9.76 mg. as observed by Rodecort, Koenig and Regenburger.⁸

Bogert and Plass⁹ studied the calcium and magnesium values in a large series of cases. They concluded that there is a definite and consistent lowering of the total serum calcium during pregnancy. This tendency was more marked toward the end of the period of gestation. Fifty per cent of the women examined in the last five months of pregnancy, showed calcium below the lowest values observed in nonpregnant women, while the same diminution was found in only 22

per cent of those examined in the first half of pregnancy. No values below the normal range were noted in the first eight weeks of gestation.

In comparison with calcium, much fewer studies of the phosphorus content of the blood in pregnancy have been reported.

In Krebs' and Briggs'¹⁰ study of the calcium and phosphorus content of the blood in normal pregnancy, they concluded that there is a great constancy of all these elements, regardless of the period of gestation, with the exception of calcium, which is slightly lowered in the last weeks. One notes, however, that in their study, the average phosphorus value for 10 pregnant women was 2.5 mg.

In Stander, Duncan and Sisson's studies,¹¹ the phosphorus content of the blood in pregnancy was not different from that in nonpregnant women.

Low normal calcium and phosphorus values in pregnancy as observed in this study are perhaps consistent with the great alteration of calcium and phosphorus metabolism occurring in cows. There is a disease known as parturient paresis or "milk fever" and likewise occurs in sheep ("lambing sickness"). Through the studies of Little and Wright,¹² Dryerre and Greig¹³ and Fish,¹⁴ this disease is shown to be accompanied by considerably decreased calcium content of the blood serum, and Fish has shown that the phosphorus content is likewise considerably decreased. Symptoms of tetany which characterize the disease are thus explained. These symptoms are promptly relieved by calcium administration.

SUMMARY AND CONCLUSIONS

1. Total serum calcium, inorganic phosphates, the calcium-phosphorus ratio and calcium phosphorus product were not different in pregnant women infected with syphilis from those in pregnant women not infected with syphilis.

2. In 24 pregnant women, late in pregnancy, the average total serum calcium was 9.35 mg. per 100 c.c. of serum; inorganic phosphates, 2.065 mg.; calcium-phosphorus ratio, 3.4, and calcium-phosphorus product, 25.4; whereas, in 22 nonpregnant women in the child-bearing period, the average total serum calcium was 10.0 mg.; inorganic phosphates, 3.25 mg.; calcium-phosphorus ratio, 3.05, and calcium-phosphorus product, 32.7.

3. Low normal values for total serum calcium and inorganic phosphates in pregnant women are perhaps consistent with the studies of others, which show that there is a disturbance of calcium and phosphorus metabolism in pregnant women, cows and rats, and disturbance of such metabolism in the disease known as parturient paresis or "milk fever" in cows and sheep.

REFERENCES

- (1) *Tisdall, F. F.*: J. Biol. Chem. 56: 438, 1923. (2) *Benedict, S. R., and Theis, R. C.*: J. Biol. Chem. 61: 63, 1924. (3) *Coons, C. M., and Blunt, K.*:

J. Biol. Chem. 86: 1930. (4) *Macy, I. G., Hunscher, H. A., Nims, B., and McCosh, S. S.*: J. Biol. Chem. 86: 17, 1930. (5) *Forbes, E. B., Schulz, J. A., Hunt, C. H., Winter, A. R., and Remler, R. F.*: J. Biol. Chem. 52: 281, 1922. (6) *Goss, H., and Schmidt, C. L. A.*: J. Biol. Chem. 86: 417, 1930. (7) *Bokelmann, O., and Bock, C.*: Ztschr. f. Geburtsh. u. Gynäk. 96: 332, 1929. (8) *Rodecurt, M., Koenig, A., and Regensburger, A.*: Ztschr. f. Geburtsh. u. Gynäk. 93: 410, 1928. (9) *Bogert, L. J., and Plass, L. D.*: Bull. Johns Hopkins Hosp. 35: 361, 1924. (10) *Krebs, O. S., and Briggs, A. P.*: AM. J. OBST. & GYNEC. 5: 67, 1923. (11) *Stander, H. J., Duncan, E. E., Sisson, W. E.*: Bull. Johns Hopkins Hosp. 36: 411, 1925. (12) *Little, W. L., and Wright, N. C.*: Brit. J. Exper. Path. 6: 129, 1925. (13) *Dryerre, H., and Greig, R.*: Further Studies in the Etiology of Milk Fever, Dumfries and Galloway, Vet. Med. Assn., July 7, 1928, Oliver & Boyd, Tweesdale Court, Edinburgh. (14) *Fish, P. A.*: Cornell Vet. No. 2, 19: April, 1929.

1934 SPRUCE STREET.

2101 PINE STREET.

(For discussion, see page 120.)

TREATMENT OF CERVICITIS BY CAUTERY AND ELECTROCOAGULATION

BY MELVIN A. ROBLEE, B.S., M.S., ST. LOUIS, MO.

(From the Department of Obstetrics and Gynecology, Washington University School of Medicine)

IT IS necessary to classify the benign pathologic lesion of the cervix uteri before attempting treatment by actual cauterization or by electrocoagulation, for the different structural elements of the lesions are much more amenable to one form of treatment than to the other.

Actual cauterization destroys tissue by carbonization and the retraction of cicatricial tissue that results should be kept in mind. Electrocoagulation, with or without carbonization, gives a different result, depending upon the depth of the coagulation and the degree of carbonization. It must also be borne in mind that cauterization with the actual thermocautery heats from the surface inward and must, of necessity, destroy the surface first before any appreciable heat penetration can take place. On the other hand, by electrocoagulation maximum heating may and does take place in the deeper structures before the superficial structures become coagulated.

Recent literature on cauterization in cervicitis has established the efficacy of this method of treatment, yet F. C. Holden states that in a review of 500 case records, the following contraindications to cervical cauterization should be kept in mind: (1) Where the disorder is one of several requiring operation; (2) slight inflammation, without eversion or erosion; (3) simple edemas, and (4) "those that do better on other treatments after trial of cautery." Cystic cervicitis was found in one case out of four in his series. He feels that the occurrence of cysts high in the canal is quite common and that for this reason a preliminary cauterization would lessen the extent of operative procedure.

R. C. Chaffin recommends that in cases of cystic cervicitis the surface cysts should be opened by knife puncture and their contents expressed with sponge forceps. He describes fulguration of the deeper portion of the cervix by twenty to thirty stab punctures with the fulgurating needle. He used the Percy cautery extensively, but advised the Sturmdorf operation in the nonlacerated cystic cervicitis group.

F. L. Payne gives the following comparative percentages: Cauterization gives 93 per cent improvement in 70 cases; trachelorrhaphy 96 per cent improvement in 24 cases; and in 77 cases studied, the modified Sturmdorf procedure gave 95 per cent improvement.

Louis Phaneuf prefers the treatment of simple lacerations with cautery and diathermy, but recommends the Sturmdorf operation for severer forms of endocervicitis.

In a study of over one thousand cases of cervicitis in The Mayo Clinic, Masson and Parson state that the cautery is as effective as amputation in the cure of leucorrhea, that pregnancy occurs more often, miscarriages are less frequent, labor is more often normal and lacerations occur less frequently following cauterization of the cervix than by amputation.

G. Kolischer states that surgical diathermy has a wide field of usefulness in gynecology, and makes special reference to coagulation of the cervix in cancerous lesions prior to radium implantation.

Gellhorn points out that in electrocoagulation the heat penetration extends far more deeply into the tissues than if fulguration or electric cautery were used. He refers to the work of A. H. Curtis in electrocoagulation together with radium in the treatment of carcinoma of the cervix.

G. E. Ward advised the use of a biterminal, comparatively low voltage, high amperage current to fulgurate the cervix in mild cases of endocervicitis, but recommends the use of cautery, as hemorrhage is less apt to occur in cases of extensive cystic cervicitis when the cautery is used.

The opposite opinion is held in cases of cystic cervicitis in the series reported by the author in this paper, as no hemorrhage has followed the electrocoagulation of cervical tissue in these cases. The possible explanation may be that tissue coagulation is instantaneous in the localized area about the knife blade electrode used by the author. The resulting coagulum is not mechanically removed but is allowed to separate as a slough.

If the types of pathologic lesions of the cervix uteri were classified as to their structural difference, some agreement might be reached as to the preferable method of treatment recommended. If cervical tissue can be destroyed by actual thermal cautery, or destroyed by electrocoagulation, why not use the different action of these two methods to bring about the structural tissue changes best suited to the correction of the lesion?

The following classification of pathologic lesions of the cervix is based upon the clinical diagnosis and represents only a proposed outline as to the best treatment recommended in each type, keeping in mind the above stated differences in the essential action of thermocauterization and electrocoagulation.

The types of cervicitis are, for convenience, divided into: First, the

chronic cervicitis group, and second, the recent postpartum cervicitis group of perhaps six to eight weeks after delivery.

CHRONIC CERVICITIS GROUP

1. Laceration with so-called erosion.*
2. Laceration with erosion and eversion.†
3. Erosion without laceration.
4. Cystic cervicitis.
5. Endocervicitis.

RECENT, SIX TO EIGHT WEEKS POSTPARTUM CERVICITIS

1. Laceration without erosion.
2. Laceration with erosion and eversion.
3. Erosion.
4. Endocervicitis.

TECHNIC OF CAUTERIZATION WITH THE ACTUAL THERMOCAUTERY IN THE CHRONIC CERVICITIS GROUP

The cervix is exposed by means of a bivalve speculum, the lateral vaginal walls may conveniently be protected by wooden applicators, or a four-blade vaginal speculum may be used. All moisture is removed from the surface of the cervical canal in order to avoid steam, productive of uterine and tubal colic. Usually it is not necessary to hold the cervix with a tenaculum forceps during the procedure. No local or general anesthesia or analgesia is used. The procedure is easily carried out in the office without marked discomfort to the patient before or after the operation.

Procedure in Type 1.—(Chronic Cervicitis Group.) (Lacerations without Erosion.) The cautery knife blade is quickly passed while hot into the cervical canal at a point deeper than the base of the laceration. This point becomes the bottom of a V-shaped incision which is quickly made well out onto the anterior and posterior lateral cervical lips, burning well into the cervical tissue, so that the maximum eschar occurs at the base of the V-shaped incision.

When this burned area sloughs out, marked retraction takes place at the point of the "V," and this cicatricial contraction will pull the anterior and posterior everted cervical lips together and the freshly denuded area will heal when so approximated. This V-shaped incision is done bilaterally in most cases; retraction is then equal on both sides. If the laceration is deeper on one side, a deeper incision is burned on that side.

Sometimes it becomes necessary to repeat this procedure once or, rarely, twice to attain the desired retraction to approximate the sides of the laceration. If the

*By erosion is meant the columnar epithelial proliferation on the outer portion of the cervical rim replacing the normal stratified epithelium normally found there.

†There is much confusion regarding the terms "erosion" and "eversion." Martzloff describes eversion of the cervical mucosa as associated with endocervicitis without mechanical injury to the cervix, such as lacerations. This lesion he states is sometimes called an erosion. In cases of laceration as from childbirth, eversion of the cervical lips is due to inflammation followed by scar tissue, which through contraction, produces an ectropion or flipping of the cervix. Hence, the usefulness of the V-shaped incision, described later under technic, to place the contraction of the newly formed scar tissue by cauterization further back in the cervical canal in order to close the flipping. It is in this sense that eversion is referred to in this paper.

True erosion of the cervix does occur, but rarely. Loss of surface epithelium which is replaced by a necrotic membrane beneath which typical granulation tissue is seen is, according to Martzloff, the origin of the small granulation tissue tumor of the cervix.

C. P. Fluhmann describes a process of epidermidalization by which is meant that the normal cylindrical epithelium of the cervix is replaced by a stratified squamous epithelium.

anterior and posterior cervical lips are so thickened as to prevent proper lateral approximation, they must be reduced in size by electrocoagulation or by radial incision through the lips with the cautery, so that better lateral approximation with healing will do away with the eversion.

Much of the erosion will be taken care of in this manner, as the healing of the bilateral laceration will correct the eversion, hence the columnar epithelium will no longer be exposed to the trauma of acid vaginal excretion.

The term "eversion" here means rather the actual structural turning out of the thickened cervical mucosa because of bilateral cervical lacerations and fibrosis with perhaps cystic formation as caused by "erosion." The production of

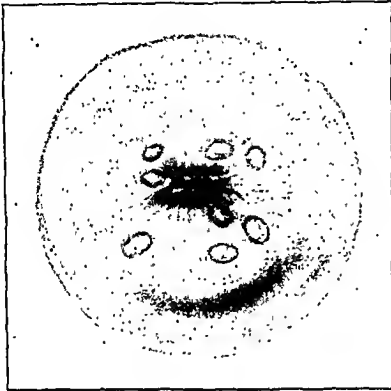


Fig. 1.

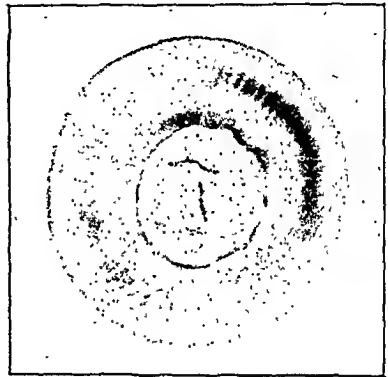


Fig. 2.

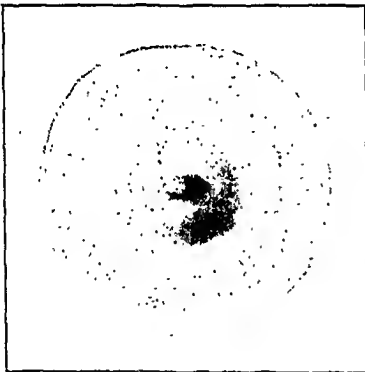


Fig. 3.

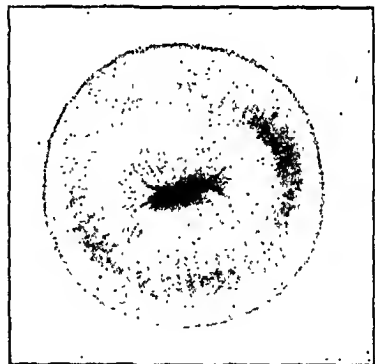


Fig. 4.

Fig. 1.—Chronic cystic cervicitis with eversion and erosion. The lighter colored area denotes erosion with some eversion. The type of case to be treated with electrocoagulation.

Fig. 2.—Ten days to two weeks after electrocoagulation (same as in Fig. 1), showing sharp line of demarcation between coagulum and normal cervical tissue. Slough loose but not fully separated.

Fig. 3.—Three and a half to four weeks after electrocoagulation (same as in Fig. 1 and 2). Coagulum separated with slough entirely out. Turning in not completed. Mixture of stratified and columnar epithelium now lining the cervical canal.

Fig. 4.—Five to six weeks after electrocoagulation (same as in Fig. 3), healing with stratified epithelium lining the canal completely. Cervical lips rolled in.

Nabothian cysts (cystic cervicitis) occurs as the columnar epithelium proliferates and blocks the openings of the racemose glands. The lining of the cysts is stratified epithelium.

Eversion, so-called, without erosion, is rare. In this incidence the more or less normal columnar epithelium may appear as an erosion because, by virtue of the bilateral laceration, the lining of the endocervical canal is mechanically exposed. In all

cases where laceration exists, attempt is made to close the lacerated area by a V-shaped, burned incision before cantherizing or electrocoagulating the everted or eroded area.

Procedure in Type 2.—(Laceration with Erosion and Eversion.) Same technic as for lacerations until the turning in takes place, then electrocoagulation of the eroded area with superficial fulguration (bipolar).

TECHNIC OF CAUTERIZATION WITH ACTUAL THERMOCAUTERY IN RECENT POSTPARTUM CERVICITIS (CASES SIX TO EIGHT WEEKS POSTPARTUM)

Type 1.—(Laceration without Erosion.) A round, blunt-tip cautery point, the size of the lead in an ordinary lead pencil and about two-and-a-half inches long, is passed, while hot, into the cervical canal and laterally to the base of the laceration, and is pressed well out laterally and held there some five to eight seconds.

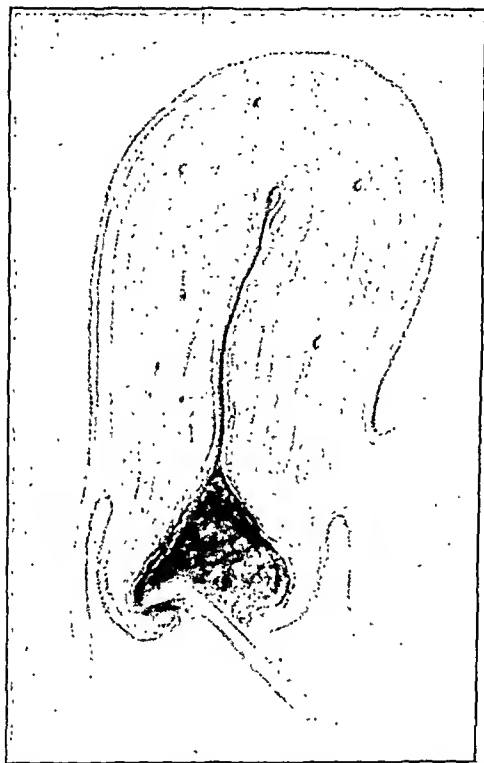


Fig. 5.—Cross-section drawing of uterus and cervix. High frequency knife electrode undermining the cervical lips. Large, conical-shaped coagulated cone (the apex of which is at the level of the inner os) will slough out, with complete healing with stratified epithelialization of the cervical canal four to six weeks later.

Type 2.—(Laceration with Erosion and Eversion.) Technic same as with lacerations. Erosions may also be cauterized (carbonized), but only superficially. It is best to cauterize erosions at least one week, or later, after cauterization of the lacerated area has sloughed.

Type 3.—(Erosion.) Superficial destruction with carbonization by actual cantery, or with superficial electrocoagulation, followed by fulguration (bipolar) with slight carbonization.

Type 4.—(Endocervicitis.) In cases six to eight weeks postpartum, in my opinion, it is best to pass the actual thermocautery well into the endocervical canal for a sufficient time only to carbonize the external endocervical glands. I feel this is better than electrocoagulation in the recent postpartum group, as destruction with the thermocautery when properly carried out is much more superficial than electrocoagulation.

TECHNIC OF ELECTROCOAGULATION

The machine is set to deliver the optimum current flow. Operation on the machine should be entirely by a foot switch control. The cervix is exposed by means of a bivalve speculum, as in the case of actual thermocauterization. However, it is not necessary to protect the lateral vaginal walls, as the generated heat is confined to the tissue that is being coagulated. All moisture is removed from the cervical canal to avoid steam, productive of uterine and tubal colic. No local anesthesia is used and the procedure may be carried out in the office without marked discomfort to the patient either during or after the operation. Hospitalization and the use of analgesia or anesthesia may be desirable in the case of nervous, apprehensive patients.

The electrode is usually of a small curved knife-blade type, which may be buried in the tissue if desired, or simply pressed against the tissue that is to be coagulated. The instrument is passed to the site of proposed coagulation and the foot switch depressed and held for sufficient time (usually ten to fifteen seconds) to produce the desired coagulation in any given area. In order to carbonize, it is only necessary to hold loosely the electrode blade against the desired tissue, so that active sparking may take place. The passive electrode is the usual abdominal belt.

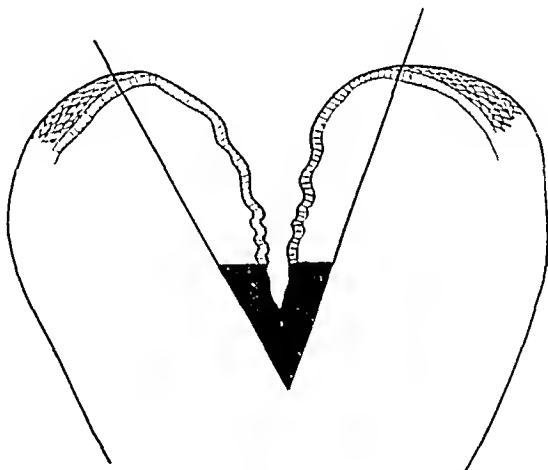


Fig. 6.—Diagrammatic drawing to illustrate V-shaped incision made by actual thermal cautery in the treatment of lacerated cervicitis. The point of the "V" is made $\frac{1}{2}$ to 1 cm. farther up in the cervical canal than the apex of the laceration. The area in black represents the carbonized cicatricial contraction that will close the everted cervical lips.

CHRONIC ENDOCERVICITIS GROUP

Type 2.—(Erosions with previously healed cauterized lacerations by V-shaped burning technic.) If the erosions are on markedly thickened cervical lips, electrocoagulation will sufficiently destroy this thickness to amply take care of the erosion as well. If, however, the erosion is on nonhypertrophied anterior and posterior cervical lips, the more superficial fulguration (bipolar) with subsequent carbonization by permitting loose contact between the surface of the cervix and knife electrode blade will give the desired result.

Type 3.—(Erosions without laceration.) Here, superficial or deep destruction of the cervical lips by coagulation followed by light bipolar fulguration is used, as in Type 2.

Type 4.—(Cystic cervicitis.) In my opinion this type of chronic cervicitis may most adequately be treated by electrocoagulation. It has been observed that in opening the Nabothian cysts of the cervix by a simple puncture, a purulent, mucoid material may readily be expressed. However, this procedure actually seems to flare up a subacute or chronic infection and produces an undesirable exacerbation of the pelvic cellulitis which is so often associated. If the actual thermocautery is

used in these cases, very extensive cervical tissue destruction accompanies the destruction of the Nabothian cysts, and, in my opinion, excessive carbonization that accompanies the actual thermocauterization seems to seal in infected material, and quite commonly produces an acute pelvic cellulitis.

The Sturmdorf operation is often recommended for chronic cystic cervicitis. The removal of a cone-shaped area from the endocervical canal will, of course, take care of these hypertrophied Nabothian cysts. As a substitute for the Sturmdorf operation, I feel at the present time, electrocoagulation will give as good results, without the untoward results of this operation, and certainly with much less carbonization of cervical tissue than when actual cauterization is employed.

TECHNIC OF ELECTROCAUTERIZATION TREATMENT IN CYSTIC CERVICITIS

The electrode knife blade is pressed firmly over the Nabothian cyst, the fluctuation of the cyst easily giving the proper site for spot placing of the electrode. When the foot switch is depressed, the high frequency current generates almost instantaneously sufficient heat in the Nabothian cyst to cause rapid expansion of the cystic contents. This heat is generated within the cyst and deeper cervical tissues. The weakest point for rupture of the cyst is the site of electrode pressure and the cyst will literally blow up at this point, discharging its entire contents in the form of steam and cystic debris. Each cyst of the cervix is treated in like manner and it is quite surprising to observe the immediate collapse of the previously, chronically thickened cervical lips which have been greatly distended, due to the presence of these multiple cysts.

After all the large cysts are thus collapsed, it is quite safe to coagulate more deeply the remaining cervical tissue, and it is quite possible to coagulate a cone-shaped area analogous to the area that would be removed by the Sturmdorf operation. The top or peak of this cone can well be carried up into the internal os and can be made to include all infected glands and cysts that might be present. After ten days to two weeks this coagulated, conical area will separate in one piece, or, as in most cases, will be disintegrated in the form of a profuse discharge. There is a clean-cut line of demarcation between slough and healthy tissue of the cervix. After the slough is out, the epithelialization of the denuded area is very rapid. Little islands of stratified epithelium can be seen even while the slough is proceeding.

Type 5.—(Endocervicitis.) In the chronic endocervicitis group, I feel that destruction by means of electrocoagulation is to be preferred to the thermal cauterization of the endocervical canal, for this reason: If the endocervicitis is chronic, the deep racemose glands of the endocervical canal are sure to be infected all the way to the base of the glands and cannot be reached with the actual thermocautery without marked destruction of the cervical tissues, which may not be advisable. In electrocoagulation the heat is generated from within out, and excessive superficial tissue destruction with subsequent cicatrix can be avoided.

I should like to review the above classifications and briefly give the reasons in summary form as to when cauterization and when electrocoagulation is to be used. In case of a recent postpartum laceration, or a laceration in a chronic cervicitis, it is advisable to destroy the cervical tissue to the point of retraction caused by subsequent scar tissue, in order to close this laceration; in such cases the use of actual thermocautery is advised. In the healing process of such lacerations, normal epithelium will follow down and over the laceration area, which is nicely pulled together by the subsequent tissue retraction.

Actual thermocauterization is preferred to electrocoagulation in the

recent postpartum erosion and recent postpartum endocervicitis, as in these cases infection is usually superficial and the deeper cervical portions and racemose glands are not so extensively involved as in cases of chronic cervicitis.

In the chronic cervicitis group electrocoagulation, with or without fulguration, will certainly more adequately destroy the deeper cervical tissue. Reference to Table I will give at a glance the proposed different methods of treatment for the various types of cervicitis.

TABLE I

Chronic Cervicitis					
TYPE OF TREATMENT ADVISED	I. LACERATION WITHOUT EROSION	II. LACERATION WITH EVER- SION AND EROSION	III. EVERSION WITHOUT LACERATION	IV. CYSTIC CERVICITIS	V. ENDO- CERVICITIS
Actual thermal cautery	Used	Used	Not used	Not used	Not used
Electrocoagulation with bipolar fulguration	Not used	Used	Used	Used	Used
Recent Postpartum (6 to 10 wk.) Cervicitis					
Actual thermal cautery	Used	Used	Used		Used
Electrocoagulation with bipolar fulguration	Not used	Not used	Used		Not used

CONTRAINDICATIONS FOR CAUTERIZATION AND ELECTROCOAGULATION OF THE CERVIX UTERI

1. Pregnancy or suspicion of pregnancy.
2. Acute cervical infection, or any acute or subacute tuboovarian inflammation, or subacute pelvic cellulitis. A subsiding subacute or beginning chronic condition of the cervix, with subsiding subacute or chronic tuboovarian disease, may safely be treated.
3. A patient two weeks or less premenstrual or before three to four days postmenstrual.

It is not advisable to coagulate or cauterize the cervix of a patient in the cancer age without first obtaining a biopsy, as biopsies taken after such a procedure give a picture of a pseudomalignancy.

This analysis of proposed treatments is based upon extensive use of the actual cautery in both recent postpartum cervicitis and chronic cervicitis during the past two years in the Out-Patient Dispensary of the Washington University School of Medicine, and in private practice, and covers several hundred cases. The average age incidence of patients treated was about thirty years. The use of electrocoagulation by the author is more recent, has been carried out for only six months, and the number of cases has been correspondingly smaller. However, I feel that it is of importance to classify the types of cervicitis and recommend neither the exclusive use of the actual cautery

TABLE II

CLINICAL OBSERVATIONS ON THE FOLLOWING TYPES OF CERVICITIS STUDIED	STRATIFIED EPITHELIALIZATION COMPLETED		ANATOMIC CLOSURE OF EVERSION COMPLETED		INCIDENCE OF BLOODY DISCHARGE AFTER TREATMENT	DURATION OF BLOODY DISCHARGE AFTER TREATMENT		CESSATION OF MUCO-PURULENT DISCHARGE	
	4 WK.	6 WK.	4 WK.	6 WK.		2 WK.	3 WK.	4 WK.	6 WK.
NUMBER OF CASES									
Cystic cervicitis with eversion, erosion and endocervicitis 37 Cases	12	25	10	27	10	6	4	30	7
Eversion with marked ectropion, without cystic cervicitis or endocervicitis 5 Cases	4	1	4	1	1	1	0	3	2
Endocervicitis without ectropion, eversion or orosion 2 Cases	-	-	-	-	0	0	0	2	-

A total number of 44 cases of cervicitis was studied over a period of six to eight weeks, at weekly intervals after electrocoagulation procedures were undertaken.
No cases required packing for hemorrhage. No cases of pelvic peritonitis or pelvic cellulitis occurred.
All cases showed marked clinical improvement. There was no incident of stenosis.

nor of electrocoagulation, but a combination of both in an endeavor to obtain the best results by means of each method. I feel that only by such classifications and clinical study will the treatment of cervicitis be placed on a rational basis.

CLINICAL RESULTS OBTAINED

Since the combination methods have been used it seems that all cases have been much improved. Anatomically, the healed cervix resembles a good postoperative result. In the case of laceration better results are obtained in most cases than where trachelorrhaphy was performed; and electrocoagulation, it is felt, will probably replace the Sturmdorf operation for the chronic cystic cervicitis group. Certainly, in the absence of other than cervical pathology requiring operative treatment, cauterization and electrocoagulation should be attempted before subjecting the patient to hospitalization for operative trachelorrhaphy or the Sturmdorf procedure.

The end-results in the cystic cervicitis group with electrocoagulation removal of a conical area of affected cervical tissue from the endocervical canal in all the cases of this series showed as good healing and as good turning-in with epithelialization of the denuded area as with a previously observed series of fifty consecutive Sturmdorf operations.

All cases showed a cessation of vaginal discharge as soon as the slough was out. All local and systemic lesions attributed to cervicitis were improved by cauterization or electrocoagulation methods in all cases involved. There was no incident of stenosis.

This work done by the author was sponsored by Dr. G. D. Royston who, for the past year, has been in charge of diathermy work on the female pelvis in the Department of Obstetrics and Gynecology, Washington University School of Medicine.

On May 12, 1930, Dr. Royston read a paper before the Washington University Medical Society, which was a preliminary report of the effect and application of Medical Diathermy in chronic pelvic inflammation. Dr. Royston will make reference in a further publication to the effect of this new surgical electrocoagulation in cervicitis in aiding medical diathermy treatments in controlling general pelvic inflammatory processes.

Dr. F. H. Ewerhardt, Director of the Department of Physical Therapies, Washington University School of Medicine, supplied the necessary diathermy apparatus for the work and aided with many valuable suggestions.

REFERENCES

- Chaffin, R. C.*: Am. J. Surg. 6: 56, 1929. *Curtis, A. H.*: J. A. M. A. 87: 1819, 1926. *Fluhmann, C. F.*: AM. J. OBST. & GYNEC. 15: 1, 1928. *Gellhorn, George*: J. A. M. A. 90: 1005, 1928. *Holden, F. C.*: AM. J. OBST. & GYNEC. 16: 624, 1928. *Kolischer, G.*: AM. J. OBST. & GYNEC. 19: 550, 1930. *Masson, J. C., and Parsons, E.*: AM. J. OBST. & GYNEC. 16: 348, 1928. *Martzloff, Karl H.*: Practice of Surgery, Dean Lewis 10: Chap. 14, Cervicitis. *Payne, F. L.*: AM. J. OBST. & GYNEC. 17: 841, 1929. *Phancuf, L. E.*: New England J. Med. 199: 1243, 1928. *Ward, J. C.*: Am. J. Surg. 8: 379, 1930. *Royston, et al.*: J. Missouri State M. A. 27: 327, 1930.

ANATOMIC CHANGES SUBSEQUENT TO THE RADIOTHERAPEUTIC TREATMENT OF BENIGN UTERINE CONDITIONS*

BY JAMES A. CORSCADEN, M.D., NEW YORK, N. Y.

INTRODUCTION

THE purpose of this study is to present the observations made over a period of several years on a series of cases of benign uterine conditions treated by x-ray and radium in an attempt to answer some still debated questions, particularly the effect of this form of treatment on the size of the myomatous uterus; the importance of x-ray and radium as excitants of latent infections; the frequency and importance of subsequent changes within the tumor, such as degeneration and sarcoma; the occurrence of carcinoma of the body and neck of the uterus and diseases of the tubes and ovaries, especially those conditions which were overlooked at the time the treatment was given and later became apparent. These answers can only be determined by prolonged follow-up examination, which will reveal what proportion of these potential conditions actually occur. Without this fact finding, isolated instances of complicating disease or, on the other hand, some brilliant triumph will overshadow the mass of less dramatic results.

The material consists of 434 patients, of whom 393 have been followed for varying lengths of time (Table I); 53 for one year, 80 from two to three years, 79 from four to five years, 136 from six to ten years, 42 from eleven to fifteen years, and 3 for over fifteen years, making an average follow-up period of seven years. While the total

TABLE I. FOLLOW-UP STATISTICS

Patients not followed		41
Patients followed	1 year	53
	2-3 years	80
	4-5 years	79
	6-10 years	136
	11-15 years	42
	Over 15 years	3
Total		393
Total patients treated		434
The average follow-up period is seven years.		

number is not great, and while the period of observation in many cases is not as long as we should like, it is felt that from these obser-

*Read at a meeting of the New York Obstetrical Society, November 11, 1930.

vations, we may appraise the probability of occurrence of the various complications even if precise statistical calculations cannot be made.

At present we are not concerned with the effect of this form of treatment upon symptoms, nor with the question of the artificial menopause; these have been thoroughly discussed in the literature and are themselves subjects of major importance.

IMMEDIATE DANGERS

The immediate dangers and injuries from radium and x-ray therapy appear so prominently in discussions of radiotherapy, that they will be briefly mentioned, although our present study concerns more the distant effects. Burns, while still possible, are of such rare occurrence that one had better refer to the older literature for information. Slough of a degree sufficient to cause distress resulted in two cases. One was in the region of the cervix where three biopsy specimens had been removed because of previous doubtful microscopic diagnosis of epithelioma. It is believed that the circulation was so disturbed by the excisions that the ordinary superficial destruction caused by the radium went much deeper. In the other case, a discharge present on admission persisted after the application of radium to a normal-sized uterus. Six months later in another city, an hysterectomy without preliminary curettage was performed for a supposed carcinoma of the corpus. The pathologic report says that the endometrium was replaced by a yellowish substance resembling pus and that there was some pus in the right tube. This seems to be a case in which radium was introduced into an infected uterus although there never were any clinical signs of an acute inflammation.

X-ray and radium toxemia with nausea, often vomiting and prostration and occasionally evidences of damage to the kidneys does occur and should be considered in persons having renal disease.

Death following the introduction of radium into the uterus is occasionally reported. In our series two women died; one, in whom hysterectomy was contraindicated because of obesity and a very poor circulation, and with the uterus the size of a six months' pregnancy, died of pulmonary embolism eleven hours after dilatation and curettage and introduction of radium; the other a negress of thirty-eight years with chronic nephritis, uremia and a blood pressure 240/150 with terrific uterine bleeding died in coma fifteen days after dilatation and curettage under gas and oxygen anesthesia and introduction of radium.

INFLAMMATORY REACTIONS

In the literature considerable emphasis is placed upon the danger of exciting quiescent foci of infection by radium and x-ray. Many such cases^{8, 12} are reported, but the precise lesion is less often described.

A knowledge of the cause and mechanism of such inflammation is of some importance for, if it be set up by the irritating effects of electromagnetic waves upon quiescent foci, a great deal of radiotherapy would have to be abandoned. If on the other hand, it is caused essentially by bacteria introduced from the outside during the operation or liberated from the cervix or other tissues by trauma incident to the operation, steps must be taken to prevent such contamination, and if this is not possible, to substitute x-ray for radium.

Of the 434 women 5 have had a marked inflammatory reaction following dilatation and curettage and introduction of 1,200 to 1,800 mg. hr. of radium (Table II). The evidence presented by these cases would support the belief that they were operative infections. Only one of the women had had children. Only one had had any evidence of previous pelvic inflammatory disease. In every case the reaction followed the introduction of radium, in none did any signs of inflammation occur after the employment of x-ray. In three, because of exigencies present, asepsis was not perfect; in two the introduction of radium followed shortly after a curettage and in one, was accompanied by a hemorrhoidectomy.

The time of onset of the inflammation corresponds with that following uterine infection, beginning from four to ten days after the operation and lasting about three weeks or up to the time the abscess pointed or was drained. Ordinarily, residual infections lighted up by other agencies (trauma, excessive fatigue, or alcohol) reveal themselves within twenty-four hours and begin to subside in a very short time. Furthermore, the location of the process in the uterus and broad ligaments, except possibly in one case, and the rapid complete disappearance of all the induration after the abscess was drained, resemble more closely the picture of metritis and pelvic cellulitis than they do salpingitis. The greater likelihood of infection in a uterus treated by radium than in one simply curetted may be explained by the presence of the superficial slough in the uterine cavity, which furnishes an excellent portal of entry. It is of further interest to note that three women, in whom hysterectomy was attempted and abandoned because of adhesions (in one of them tuberculosis), were given x-ray treatments, soon after the wound had healed, with no sign of an inflammatory reaction. This would agree with the experience of Polak,¹⁴ and Gal⁵ who have employed the x-ray in the management of acute pelvic inflammatory disease.

We would conclude then that the evidence presented in these cases would point toward an operative contamination as the cause of inflammation following the introduction of radium rather than some less obvious effect of the electromagnetic waves upon either the tissues or bacteria in a residual inflammatory focus.

TABLE II. INFLAMMATION FOLLOWING INSERTION OF RADIUM

PREOPERATIVE HISTORY	INDICATION	ASEPSIS	INFLAMMATION			
			ONSET	DURATION	LOCATION	COURSE
0 0	Menorrhagia	Good	5th day	20 days	Uterus, broad ligaments	Pointed in rectum
	Metrorrhagia	Good	6th day	18 days	Uterus, both broad ligaments	Pointed in rectum
Old salpingitis? Dilatation and curettage 10 days previously Pulmonary tuberculosis	Metrorrhagia	Poor	5th day	21 days	Primary unknown culde-sac	Pointed in rectum
	Uterus 3 months' size	Poor	4th day	10 days	Left broad ligament	Colpotomy
Dilatation and curettage 3 mo.	Menorrhagia	Hemorrhoidectomy simultaneous	9th day	11 days	Uterus, left broad ligament	Colpotomy

CHANGES IN THE TUMOR

In practically all discussions of radiotherapy for fibromyoma, the danger of degeneration is stressed, especially when the tumor is large. In this series, only one patient presented symptoms and physical signs which would indicate that degeneration had taken place. January 1, a woman aged thirty-five years with a uterus the size of a five months' pregnancy, after a diagnostic curettage, was given a sterilizing dose of x-ray. From February 2 to 6 she had a normal period. February 13, there was pain in the right side of the abdomen, maximum on the right side of the tumor over an area 5 to 6 cm. in diameter. The temperature was 101° F.; there was slight prostration and slight leucoeytosis. The symptoms disappeared after a few days, but the patient was kept in bed for two weeks as a precautionary measure. She was observed and found in perfect health at the end of the year. The uterus was the size of a two months' pregnancy; no periods had occurred. This disturbance was attributed by some to the upset menstrual cycle, but the occurrence of fever and leucoeytosis and the localization of the pain and tenderness, lead me to believe that there was a degeneration in a segment of the uterine mass.

DIAGNOSTIC ERRORS

In deciding the question of whether to employ radiotherapy or to perform hysterectomy for a fibromyoma or hemorrhage from the uterus, one of the most important questions is that of the possibility of overlooking important lesions in the pelvis. With x-ray treatment without diagnostic curettage both extra- and intrauterine conditions may be overlooked. With the diagnostic curettage and introduction of radium, there should be practically no undiscovered intrauterine disease. In this series, approximately 3 per cent of the patients treated have revealed unexpected intrauterine pathology such as polyp, pedunculated fibromyoma, and carcinoma of the body, which was given appropriate treatment. Even with this curettage and examination under anesthesia, there is still a possibility of overlooking pelvic lesions. Most authors report an incidence of about 50 per cent of adnexal disease associated with fibromyoma uteri operated upon. In this series there were two such cases, one a patient with sarcoma of the uterus already reported² and the other a woman who returned six months after operation with a general abdominal carcinomatosis. At the original examination vague symptoms of epigastric distress after eating, general abdominal pain, and loss of flesh and strength had been overshadowed by the uterine bleeding. The microscopic examination of a piece from the omentum suggested an ovarian origin. Whether the original growth was ovarian or gastric is not important:

the presence of these other symptoms should have demanded more extensive diagnosis and possibly an exploratory laparotomy.

THE SIZE OF THE TUMOR

There is considerable divergence among the opinions expressed concerning the effect of radiotherapy on the size of myomas. Burnam¹ for instance, reports very favorable results, while most of those advocating hysterectomy warn of the dangers of radiating masses larger than a three months' pregnancy.^{8, 12} In this series 114 women had masses larger than this (Table III), and of these, 96 were followed up. Of the tumors, three or four months in size, that is, easily palpable above the symphysis, 3 were not reduced; 1, in a woman of forty-eight years, was examined only two months after treatment and perhaps is not properly listed. By correspondence she reported no pelvic symptoms eight years later. Another was in a woman of sixty-six years who bled periodically and was extremely obese. Neither the bleeding nor the size of the uterine mass was permanently influenced by large doses of radium. The third uterus after eight years equalled in size the original mass, although at this time a carcinoma of the corpus formed the greater portion of it. The 8 tumors listed as slightly reduced showed definite reduction, but so little that, were the size of the tumor important, the treatment would have been considered a failure. Twenty tumors were so reduced in size that they ceased to be of any importance, while 49 shrank to the size of the normal uterus, although some were still slightly nodular.

TABLE III. REDUCTION IN SIZE OF UTERUS FOLLOWING RADIOTHERAPY

ORIGINAL SIZE	NONE	SLIGHT	SATISFACTORY (50-75%)	COMPLETE	NOT FOLLOWED	TOTAL
3-4 mo.	3	8	20	49	16	96
5-6 mo.	0	3	6	3	2	14
7-8 mo.	1	1	1	1	0	4
Total	4 (4.17%)	12 (12.5%)	27 (28.13%)	53 (55.2%)	18	114

Of the tumors five to six months in size, 3 were slightly, 6 satisfactorily, and 3 completely reduced. Of the very large tumors, 3 were treated by radium and x-ray because operation was contraindicated by anemia, extreme obesity, and phlebitis. The anemic patient became perfectly well and was operated upon a year later because of recurrence of bleeding. The mass in the obese woman had shrunk after two years to the size of a four months' pregnancy. The fourth patient, the only one with a free choice of treatment, had a perfect result. The mass, originally reaching the ensiform, after eighteen weeks' intensive treatment, shrank after five years to the size of a two months' pregnancy and at the end of fifteen years, to normal dimensions.

In saeuning the tables it would appear that the larger masses shrank less satisfactorily than the smaller. It should be noted, however, that in our hands these are treated with radium and x-ray only when operation is contraindicated. We prefer to operate on them because of the greater likelihood of a mistake in diagnosis and of there being a degeneration in one of the masses. It is difficult to say why one mass should shrink more rapidly than another. Clinically it has been observed that the softer masses shrink much more rapidly than those of a very hard consisteney and it is inferred that, in these, the smooth musele has been replaced by hyaline or possibly calcified tissues which will be little reduced in volume. The rate of shrinkage is equally variable. Some of the masses have disappeared in two months, others in six months; most of them became stationary at the end of one or two years; a few regularly observed have continued to shrink for five years, and one uterus apparently continued to diminish in size after this.

These observations would confirm the general opinion that large tumors are not well reduced by ordinary doses of radiotherapy, but that, where the size of the tumor is not the main indication for treatment, any increase in size can be definitely prevented, and an almost certain promise of a reduction in size can be given. Moreover, the results are good enough to demand that hysterectomy mortality should be kept down to a percentage representing operative accidents, such as pulmonary embolism and pneumonia, and that the postoperative morbidity and interference with the earning capacity be kept down to a minimum. Where the unfavorable condition of the patient or the presence of nonemergent local complications, such as adhesions which present great technical difficulties, promise a high mortality, the operation should, if possible, give way to radiotherapy; and when such local conditions are found unexpectedly during an operation, the surgeon should not hesitate to withdraw and use x-ray at a later time. The treatment of myoma is rarely an emergency, and in each case should be designed for necessary relief with a minimum of harm. It should not be determined by the extreme considerations present in the treatment of a disease like carcinoma.

CARCINOMA OF THE UTERUS

The likelihood of a carcinoma growing in a uterus is believed by many to be increased by the irritating effects of a therapeutic dose of radium and by others to be diminished by the very same factor. Whether or not the radiotherapeutic menopause influences the incidence of carcinoma of the uterus one way or another could best be established by a mass of direct observations showing the occurrence of carcinoma in uteri so treated, and comparing this with the incidence among women in general. This is at present impossible because the

scattered reports of carcinoma are mostly of individual cases, rarely covering any extended period of observation, and are usually made by persons other than those who gave the initial treatment. The general incidence of carcinoma of the body of the uterus is 0.5 per cent; of carcinoma of the cervix 1.9 per cent.¹⁰ The incidence of carcinoma with fibromyoma is difficult to determine because many reporters, as for instance Cullen,³ only consider fibroids which have a clinical significance. He reports an incidence of 1.7 per cent of carcinoma of the body and 1.3 per cent of carcinoma of the cervix. Viewed from another angle, Norris and Vogt¹² found myomas in 20.8 per cent of cases of carcinoma of the body, while Olshausen reports 10 per cent. Fibromyoma of the uterus occurs in nearly 50 per cent and in nearly all unmarried middle-aged women.¹⁸ Carcinoma of the cervix in the pathologic collection of a gynecologic service¹¹ occurs about five times as frequently as carcinoma of the body. From these figures no very definite percentages can be established, but they indicate that carcinoma of the uterus might be found in 2.4 per cent of women in general and in 3 per cent of cases of fibromyomas which give symptoms.

In discussing the results of radiotherapy, Ford⁴ reports 6 cases of carcinoma developing within one year after the application of radium to myomatous uteri, 2 after two years, and one after three years. In the cases here reported 2 cases of adenocarcinoma of the body occurred, once in a uterus originally the size of a four months' pregnancy, eight years after treatment when the uterus was unchanged in size, and once after four years in a uterus originally of normal size but containing tiny seeds of myoma and a polyp. Two cases of carcinoma of the cervix of cylindrical cell type occurred, one after eight years in a uterus originally the size of a five months' pregnancy but now the size of six weeks' pregnancy; the other after six years, in a uterus originally of normal size and now of senile dimensions. One typical squamous cell epithelioma appeared after seven years in a uterus originally the size of a four months' pregnancy. These 5 cases of carcinoma of the uterus occurred in 393 women followed for an average of about seven years, giving an incidence of 1.28 per cent for that period.

ADENOMYOMA

Adenomyoma was discovered once in a uterus treated seven years previously. Had there not been a complete autopsy of a woman dying of myelitis caused by syphilis of a vertebra, it would not have been detected and yet, small as it was (1 cm. in diameter), the microscopic picture was characteristic. One expects endometrial tissue to atrophy after the menopause, but in this case the glands were well formed, the epithelium of good height with well stained nuclei.

DISEASES OF THE ADNEXA

In the reports of the lesions found at operation for fibromyoma of the uterus, there are noted diseases of the adnexa in about 50 per cent of the cases.⁸ In this series, the only case of disease of the fallopian tube occurred in the case already mentioned among those having sloughs. Of diseases of the ovary, there have been 4. One, a woman of forty-nine years with a normal uterus and metrorrhagia, was given 1,200 mg. hr. of radium resulting in an amenorrhea, with no symptoms except continuation of hypertension and chronic heart disease until nine years later when there was slight uterine bleeding. The euretteage was negative. Several masses were felt in the pelvis, one in the rectovaginal septum, biopsy of which showed carcinoma. A month later the patient died with an acute cardiac decompensation. Autopsy showed carcinoma of the ovary with generalized metastasis. Two true cystadenomas, one containing areas which looked suspicious of carcinoma and one unclassified cyst with a lining of flat cells occurred after four years, five years, and seven years respectively.

Aside from these tumors, there were no enlarged ovaries. The small number of cystic conditions in the ovaries may be explained in part by the effect of the rays on the follicular apparatus. The same atrophy of the follicles which determines the sterility may, by eliminating these cells, prevent subsequent follicular changes which would go on to form cysts. This effect has been apparent in four cases with definite cystic ovaries which have been treated by radium and x-ray with disappearance of the ovarian enlargement. These previously had been examined during a laparotomy, three times for resection of cystic ovaries for dysmenorrhea and once for hysterectomy. In this case, the ovary, left in on general principles, enlarged to about 8 to 10 cm. in diameter within six months. X-ray was given because the patient absolutely refused operation.

LESIONS IN THE REST OF THE BODY

In 119 patients there have occurred the following diseases: vulvar abscess, 1; earuncle, 1; chronic vaginitis, 1; cervicitis, 1; cystitis, 2; cerebral embolism, 1; cerebral hemorrhage, 3; auricular fibrillation, 1; hypertension, 4; arteriosclerosis, 1; chronic cardiac valvular disease, 1; Graves's disease, 1; neurosis, 6; melancholia, 1; herpes zoster, 1; endothelioma of lung, 1; sarcoma of iliac bone, 1; carcinoma of breast, 2; lipoma, 1; carcinoma of rectum, 1; benign rectal tumor, 1; pneumonia, 2; pulmonary tuberculosis, 3; asthma, 1; undiagnosed abdominal pain, 1; digestive disturbances, 4; hyperchlorhydria, 1; hemorrhoids, 1; pruritus ani, 1; diverticulum of sigmoid, 1; diverticulum of duodenum, 1; duodenal ulcer, 1; appendicitis, 1; cholecystitis, 7; arthritis, 41; diabetes, 3; nephritis, 6; nephrolithiasis, 1; ureteral calculus, 1; myelocytic leukemia, 1; syphilis of vertebra, 1; bursitis,

3; alopecia areata, 1; sacroiliac disease, 1; and hallux valgus, 1. Of these conditions none has occurred with enough frequency to demand attention except arthritic symptoms. These are being studied and will be discussed later.

PREGNANCY

Three women became pregnant and have been already reported.¹⁹

SUMMARY

In all of these diseases, whether of the reproductive organs or in the rest of the body, the incidence seems lower than the normal rate. The only explanation is that at the time of the original admission an effort was made to make a thorough investigation, and if anything was found which would suggest adnexal disease or if suspicious conditions of the uterus were found at the exploratory curettage, other measures were employed. Diseases of other organs were given appropriate treatment. In 3 per cent of the cases in which a diagnostic curettage was performed prior to the planned administration of radium, there have unexpectedly been found conditions (carcinoma of the body of the uterus, epithelioma of the cervix, pedunculated intrauterine myomas, polyp) which have caused a change in the method of treatment. If they had not been so examined, they would have added to the list of local diseases which appeared later.

Aside from the diseases of the genital organs there have been referred for treatment of a myoma, patients whose symptoms were found to be caused by gall bladder disease, gastric ulcer, gunuma of the small intestine, carcinoma of the rectum, diverticulitis of the sigmoid, and tuberculosis of the kidney. These conditions are cited to bring out the point that errors in diagnosis with fibromyoma are not limited to diseases of the pelvis. The exploratory suprapubic incision would have helped little toward their relief.

From the evidence here presented, it would appear that the use of x-ray and radium for the treatment of benign uterine conditions is relatively harmless. Of the local conditions attributable to its uses, there occurred in one case a slough, in another a slight degeneration. All the other accidents followed the operation of dilatation and curettage and may be attributed to it, the rôle of the radium being doubtful. There was one death from embolism and one from uremia. Five patients had postoperative inflammation, all but one being fairly definitely due to operative contamination. The effect of this treatment on the size of the uterine myomas varied. Growth was stopped in all patients treated, reduction to a satisfactory degree has occurred in 83 per cent, and there has been complete reduction of the mass to the size of a normal uterus in 55.2 per cent. The treatment was less

TABLE IV. TUMORS OF REPRODUCTIVE ORGANS

ORIGINAL CONDITION		SUBSEQUENT DISEASE					
PELVIC EXAMINATION ANTE-OPERATIVE	TREATMENT	DISEASE	ONSET POST-OPERATIVE	LOCAL CONDITION	TREATMENT	RESULT	FOLLOWED
Uterus size 4 mo. Nodular cavity	Dilatation and curettage; radium	Adenocarcinoma of uterus	8 yr. 3 wk.	bleeding. Extensive carcinoma	Excision, x-ray	Recurrence	2 yr.
Size 6 wk. Nodular endometrium. Polyp.	Dilatation and curettage; radium	Adenocarcinoma of uterus	4 yr.	Uterus normal size. Small carcinomatous bits in cavity. At hysterectomy no carcinoma found	Dilatation and curettage; radium excision	Perfect health	1 yr.
Size 5 mo. Clarke test for carcinoma	X-ray	Adenocarcinoma of cervix	8 yr.	Uterus size 6 wk.	Radium	Died	2 yr.
Normal size. Cavity smooth. Curettings grossly normal. Cervix granular	Dilatation and curettage	Carcinoma of cervical canal	6 yr.	Uterus small. Cylindrical cell carcinoma of cervix	Radium	Well	3 yr.
Size 4 mo. Nodular. Cervix hard, lacerated	Dilatation and curettage; radium	Epithelioma of cervix	7 yr.	Uterus normal size. Squamous cell epithelioma of cervix	Radium	Died	6 mo.
Normal	Dilatation and curettage; radium	Carcinoma of ovary	10 yr.	General abdominal carcinomatosis	Biopsy	Died; autopsy	
Size 3 mo. Mass felt posteriorly. Clarke test for carcinoma	X-ray	Cyst of ovary	7 yr. 10 cm.	unilocular cyst. Uterus slightly enlarged. Adenoma. Transverse myelitis	None	Died of myelitis; autopsy	1 yr.
Size 5 mo. Fundus enlarged, extending halfway to umbilicus	Dilatation and curettage; radium	Cystadenoma of ovary	4 yr.	Cyst 30 cm. Uterus 1½ mo.	Excision	Well	4 yr.
Normal size, trifle rounded, firm, cavity smooth	Dilatation and curettage; radium	Cystadenoma of ovary	5 yr.	Cyst 27 cm. Uterus small, atrophic	Left salpingo-oophorectomy	Well	2 mo.

Sarcoma of the Uterus: There has just come in the report of a patient operated upon for a pedunculated intrauterine tumor, diagnosed microscopically as adenosarcoma occurring in a woman who received, twelve years previously, 1,200 mg. hr. radium in a normal uterus. The details of this case to be reported later. Six cases of sarcoma of the uterus following radiotherapy have been reported. (2, 6, 7, 11, 17)

satisfactory in the large masses but good enough to demand that operative mortality and morbidity from hysterectomy should be kept down to an irreducible minimum.

Perfection in diagnosis, because of the seriousness of the conditions likely to be overlooked, should above all things be the goal of the physician who would treat these benign conditions. With this object in view, one must decide how far he should go in making the diagnosis by exploration. Certainly the diagnostic curettage is made almost imperative by the large percentage of intrauterine lesions so discovered. Exception to this rule involves great responsibility and possibly even liability. The exploratory laparotomy on the other hand is much more serious and should be undertaken only for clear-cut reasons (size of tumor, indefiniteness of outline, involvement in or association with masses which seem to be extrauterine).

Usually at the time of exploration there will be removed whatever seems necessary. This brings up the question of prophylactic excisions. Is it ever proper to treat by conservative means uterine bleeding or myoma; should not, in all, the uterus and probably other organs be removed? The evidence (Table IV) from these cases would indicate that the incidence of diseases in the organs of reproduction after treatment by x-ray and radium is a little less than in women in general, so that the question of prophylactic excision becomes one of interest to all women and not especially to this group. The occurrence of uterine bleeding and discovery of a small myoma does not make one a candidate for promiscuous prophylactic excision; with the bleeding stopped and the uterus made smaller by radium or x-ray, she has the same chance for health as the woman without these conditions. Certainly there is no information which would require wholesale prophylactic excision of the sex organs. We must continue to rely on routine periodic examinations and attack conditions in their incipency as they arise.

Finally, with a multiplicity of therapeutic measures available for the treatment of uterine bleeding and myomas, the patient must be protected from the danger usually attendant upon such a situation. With 11 possible variations in treatment (simple observation, curettage, myomectomy, supravaginal and complete hysterectomy with or without removal of the tubes, ovaries and cervix, double oophorectomy, partial and sterilizing doses of radium and x-ray, and x-ray of the uterus with protection of the ovaries), she must be under the control of one guiding individual or group who will not allow her to be lost among the various therapeutic specialists, nor to suffer from the competitive spirit unfortunately still occasionally evident. She will be best cared for by a gynecologic staff who practice all methods of therapy, operative, radiotherapeutic, or any other.

CONCLUSIONS

A study of 434 women of whom 393 were followed from one to seventeen years with an average follow-up period of seven years shows that:

1. X-ray and radium furnish a safe method for the treatment of fibromyomas and uterine bleeding.
2. The most important factor in the radiotherapeutic treatment of these conditions is accurate diagnosis. When this is doubtful, whether because of lack of diagnostic equipment on the one hand, or because of the inherent difficulties presented, exploration should be performed.
3. Degeneration in a treated myoma is rare.
4. The incidence of tumors of the uterus (sarcoma, carcinoma, epithelioma) is unaffected by the artificial menopause.
5. The incidence of tumors of the ovary is uninfluenced by the method.
6. Cystic changes in the treated ovary occur with much less frequency than in the average woman of the same age.
7. Of the cases followed, a reduction in the size of the fibromyoma has occurred in 96 per cent; in 55.2 per cent, a complete disappearance; in 28.3 per cent, a reduction of 50 or more per cent; in 12.5 per cent, a definite but unimportant reduction. The larger tumors have responded less satisfactorily than the smaller.
8. The reduction in the size of the masses has been satisfactory enough to demand that operative mortality and morbidity from hysterectomy be lowered to an irreducible minimum.
9. The inflammatory reactions following dilatation and curettage and the introduction of radium seem to be due more to the operative procedure rather than to the effect of the electromagnetic waves. No case of acute inflammation followed the use of x-ray.

REFERENCES

- (1) Burnam, C. F.: AM. J. OBST. & GYNEC. 8: 411, 1924. (2) Corssaden and Stout: Am. J. Roentgenol. 21: 155, 1929. (3) Cullen and Kelly: Myomata of the Uterus, Philadelphia, 1909, W. B. Saunders Co. (4) Ford, F. A.: Surg. Gynec. Obst. 42: 245, 1926. (5) Gal, F.: Strahlentherapie 31: 556, 1929. (6) Hinterstoisser, H.: Zentralbl. f. Gynäk. 44: 977, 1920. (7) Jaquin, P.: Gynec. et obst. 3: 90, 1921. (8) Keene, F. E.: Surgical Clinics of North America 6: 67, 1926. (9) Keene and Block: AM. J. OBST. & GYNEC. 17: 848, 1929. (10) Mortality Statistics, Dept. of Commerce, Bureau of the Census, Washington, 1928. (11) Norris, C. C.: Uterine Tumors, 1930, Harpers Bros. (12) Norris and Vogt: AM. J. OBST. & GYNEC. 7: 550, 1924. (13) Polak, J. O.: Am. J. Surg. 6: 648, 1929. (14) Polak, J. O.: AM. J. OBST. & GYNEC. 18: 580, 1929. (15) Shoemaker, G. E.: Tr. Coll. Phys. Phila. 37: 142, 1915; Boston M. & S. J. 173: 210, 1915; J. A. M. A. 64: 1643, 1915. (16) Vogt, E.: Strahlentherapie 24: 313, 1926-27. (17) Wagner, G. A.: Med. Klin. 14: 897, 1918. (18) Graves, W. P.: Gynecology, Philadelphia, 1928, W. B. Saunders Co. (19) Murphy, D. P.: AM. J. OBST. & GYNEC. 18: 179, 1929.

THE ELLIOTT TREATMENT

A NEW METHOD OF APPLYING VAGINAL HEAT*

BY FREDERICK C. HOLDEN, M.D., AND W. S. GURNEE, M.D., NEW YORK

MANY discoveries of modern medicine are but rediscoveries which have been erased from the memories and records of men. Even as far back as 450 B.C., Hippocrates, who first systematically considered the diseases of women, recorded fundamental principles which still stand in methods of treatment today. Of these, we shall consider the vaginal injection or douche, which he prescribed in the hygiene of the genitalia and for relief of pelvic pain.

Forgotten for a time, the douche was rediscovered 1000 years later, and written about by Galen and Celsus.

From their time until 1683, there was little or no progress made in the diseases of women, chiefly because of the Moslem religion, which forbade visual and digital examination of the female genitalia by male physicians. Gynecology became a lost art, necessitating, once more, physicians of this period to start anew. The value of applying heat to the vagina was quickly rediscovered. German physicians heated shot and poured it into the vagina in order to maintain prolonged heat and greater distention than could be obtained by the injection of hot water alone.

In the early nineteenth century, intrauterine douching displaced the intravaginal, until Emmett condemned the use of intrauterine douches and once again advocated the hot vaginal douche in the treatment of pelvic inflammatory diseases, by which procedure he felt he saved many of his patients from operation. He stressed attention to detail and attributed his successes to this factor.

In 1924, Gellhorn obtained greater intravaginal heat by recognizing that the vaginal mucosa was less sensitive to heat than was the vulva and perineum. He applied a prolonged vaginal douche, using 2 gallons of water, at a temperature of 115° to 120° F., the woman sitting in a bathtub, the vulva and perineum being protected with vaseline. To this method, Gellhorn attributed good results in pelvic inflammatory disease, subinvolution and pelvic pain, many cases being cured without operation.

Dr. Charles Robert Elliott also observed this lesser sensitivity of the vagina to heat. He devised what we believe to be the best method of application of heat to date; namely, a distensible vaginal bag through which water is introduced and maintained at any desired temperature and pressure. By this method it is possible to introduce

*Read before the New York Academy of Medicine, Section of Obstetrics and Gynecology, April 28, 1931.

a bag containing water at a temperature of 115° to 120° F., increasing the heat $\frac{3}{4}$ of a degree per minute until a temperature of 130° is reached. This is maintained for the remainder of the hour and constitutes one treatment. The bag is maintained at quite a large size as is shown in Figs. 1 and 2.

The heat is distributed equally in all directions. Thermometers inserted in the urethra, bladder, and rectum of a patient having a nor-

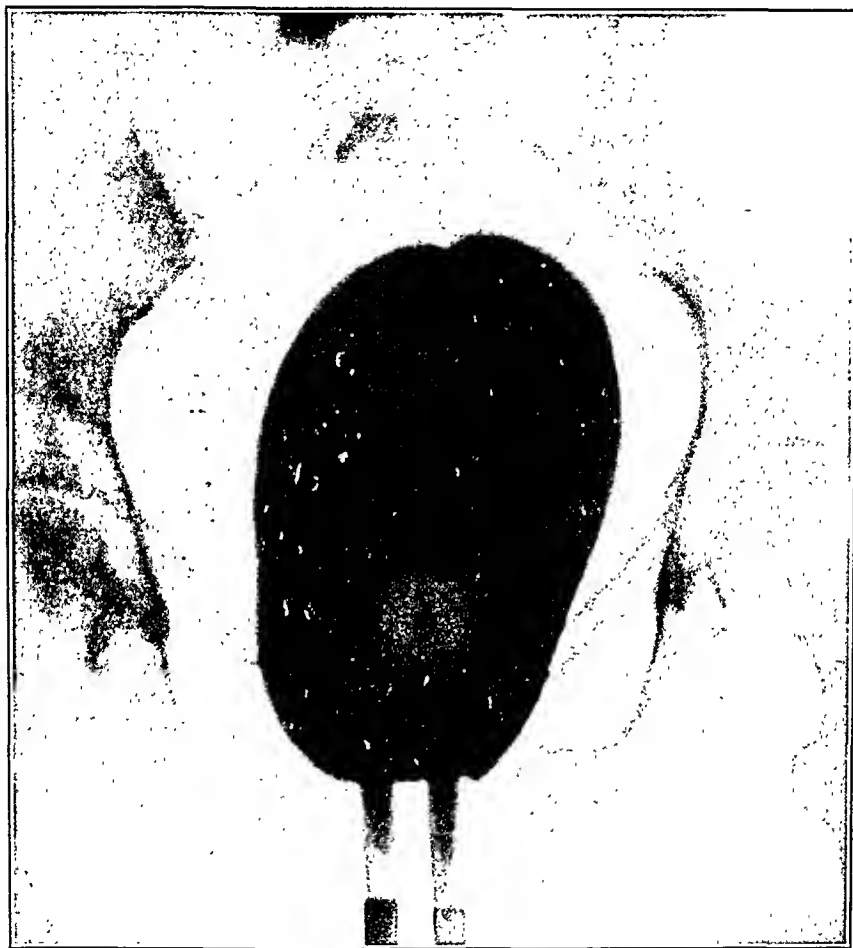


Fig. 1.—Showing bag in position in vagina.

mal mouth temperature, read as follows: in the urethral meatus 104° , in the bladder proper 104.1° , anterior rectal wall 106° , posterior rectal wall 104° . The rise in mouth temperature after one hour's treatment varies from no rise to $\frac{1}{10}$ of a degree increase. Speculum examination after a treatment shows that the hyperemia caused a marked increase in the cervical and vaginal secretions. After two treatments, the cervix is softened and actually becomes shorter and broader, thereby causing a widening and shortening of the cervical glands.

In a pelvic inflammatory case, mobility of the uterus increases with continued treatment, tenderness decreases, and the uterus and adnexa can more easily be outlined, due to absorption of the exudate. White blood counts taken immediately before and after the treatment in 236 instances showed a leucocytic increase of 17.1 per cent in 207, a 9 per cent decrease in 28, and one had no change at all.

INDICATIONS FOR ELLIOTT TREATMENT

In the first 150 consecutive cases of pelvic inflammatory disease treated by the Elliott apparatus, we used the treatment in all types



Fig. 2.—Lateral view, showing possible vaginal distention.

and degrees of pelvic pathology, acute and chronic. All patients treated were sick enough to necessitate hospitalization. This treatment was at first used in cases of cellulitis and the so-called frozen pelvis. We then tried it in pelvic abscesses before fluctuation thinking that it would hasten the formation of pus. To our astonishment, however, resolution took place instead. As we became more familiar with the action of this type of heat, we did not hesitate to treat acute salpingitis with or without pelvic peritonitis. (Table I.)

TABLE I. COMPARISON OF PATHOLOGIC LESIONS ON DISCHARGE

ACUTE SALPINGITIS			CHRONIC SALPINGITIS	
FORMER TREATMENT BELLEVUE 1926-1927	ELLIOTT TREATMENT BELLEVUE 1929-1930	DEGREE OF DIMINISHED PATHOLOGY	FORMER TREATMENT BELLEVUE 1926-1927	ELLIOTT TREATMENT BELLEVUE 1929-1930
None	None		None	6.8%
12%	51%	No pathology palpable	10%	34.5%
18%	32%	Marked improvement	20%	48.2%
20%	13%	Considerable improvement	30%	10.5%
50%	4%	Slight improvement	40%	None
		No improvement		
PELVIC CELLULITIS			PELVIC ABSCESS	
None	None	No pathology palpable	None	3.4%
None	28.5%	Marked improvement	None	34.5%
None	64.2%	Considerable improvement	10%	55.3%
60%	7.3%	Sight improvement	30%	3.4%
40%	None	No improvement	60%	3.4%

This series was begun in November, 1929, and ended in August, 1930. Our follow-up has been fairly complete for a city institution, the patients returning for frequent reexamination. We have given 5,233 treatments to date in about 500 cases and have had only one severe burn which was the result of personal negligence on the part of the nurse who allowed the temperature to reach over 145°. In this case the treatment was not discontinued, but given daily at a temperature of 124°; the white slough was soon replaced with new mucosa, without any untoward effect. Eleven other cases received slight burns about the introitus, and eight had mild burns in the lateral fornices. These we attribute to poor distention of the bag.

The Elliott treatments are given in conjunction with rest in bed, bowel hygiene, and sedatives as needed. In the cases being reported, modified Fowler's position of the bed was maintained if the temperature of the patient was high.

Our former treatment for pelvic inflammations, consisted of rest in bed, modified Fowler's position, bowel hygiene, sedatives, ice bag to the abdomen, and milk injections or diathermy if a low-grade temperature persisted. No local treatments were carried out. Our previous experience was that a patient with pelvic inflammatory disease under the above régime, was usually discharged symptom and temperature free, but not organism nor pathology free. By the use of the Elliott treatment, we believe we are directing our efforts more toward a "cure" by causing absorption of the pathologic exudate and making the patient organism-free, thereby preventing future exacerbations.

DIMINUTION IN THE PATHOLOGIC LESIONS

To evaluate the Elliott treatment, we have selected from the Bellevue Hospital record room, as our control series, the charts of non-operative pelvic inflammatory cases from our Service, during 1926-

27 and compared the admission pathologic findings with those at the time of discharge. Likewise, the admission and discharge findings of all the Elliott cases were compared, estimating the degree of improvement from four plus to one plus, that is, from no residual pathology to no improvement of pathology. The results as thus tabulated show a more rapid absorption of the pelvic exudates with the Elliott treatment. This fact we believe to be of prime importance. (Table II.)

It is interesting to report that all types of pelvic inflammations of infections responded equally well. It is our opinion, however, that the earlier the acute inflammations are treated by this method, the better the results will be. We believe that the continued action of the heat stimulates the circulation in the pelvis so that the local congestion is relieved before there is an exudate formed in the surrounding tissues causing a cellulitis. The latter forecasts a much longer illness.

In acute salpingitis there was rapid relief of symptoms, with decreasing pathology and seldom were there any reactions following treatments.

Under salpingitis we have also included tuboovarian abscesses, varying from moderate size to those that fill the entire lower abdomen. Of the latter, we had eight such cases, where the mass extended more than halfway to the umbilicus. One case responded so vigorously and the mass sank down so low into the pelvis, that the bag could not be introduced into the vagina, necessitating culdesae drainage. All the other cases escaped operation and were discharged with little or no pelvic pathology.

We treated 33 cases of pelvic abscess, ten of these only after colpotomy had been performed. The Elliott treatment was started on the third day postoperative at which time the vaginal packing was wholly or partially removed. The patients were allowed out of bed as soon as the temperature touched normal to afford better dependent drainage. The pressure of the bag, together with the heat, hastened the expulsion of the pus and the healing of the sinuses.

Of the remaining 23 cases of pelvic abscess in which treatment was continued despite fluctuation, only three cases required culdesac drainage, because the temperature and toxic symptoms were running fairly high. The other twenty cases needed no drainage, since resolution took place instead.

GONORRHEA

Gonorrhea of the female genital tract has been resistant to former treatments mainly because of the many glandular crypts in which the organisms are safely harbored. The three important points of latency are, the cervix, urethra, and Bartholin's glands. Since gonorrhea is char-

TABLE II. ONE HUNDRED FIFTY CONSECUTIVE CASES TREATED WITH THE ELLIOTT APPARATUS AT BELLEVUE HOSPITAL, NEW YORK CITY

		NUMBER OF PATIENTS	AVERAGE NO. DAYS IN HOSPITAL BEFORE E.T. COMMENCED	AVERAGE NO. DAYS IN HOSPITAL FROM TIME OF FIRST E.T. UNTIL DISCHARGE	AVERAGE NUMBER E. T.	AVERAGE NO. DAYS IN HOSPITAL BEFORE AND DURING E. T.
ACUTE SALPINGITIS, CAUSE, GONORRHEA, 53 CASES		32	8.2	10.8	8.5	19.0
1. Salpingitis or tuboovarian abscess		9	7.5	22.3	19.8	29.8
2. With pelvic peritonitis		7	12.9	14.7	11.1	27.6
3. With pelvic parametritis or cellulitis and peritonitis		10	8.0	20.9	13.7	28.9
4. With pelvic abscess		—				
A. Pelvic abscess, postceolpotomy before treatment	2					
B. Pelvic abscess treated, requiring later postceolpotomy	3					
C. Pelvic abscess treated, postceolpotomy not necessary	5					
A-1. Elliott treatment ordered to prepare patients for laparotomy. Elliott treatment given and laparotomy not performed	4					
B-1. Warned to watch for ectopic	4					
C-1. Tuboovarian masses extending 1/2 way or more to umbilicus	4					
ACUTE SALPINGITIS, CAUSE, ABORTION, 20 CASES						
1. Salpingitis or tuboovarian abscess		8	9.2	10.3	7.3	19.5
2. With pelvic peritonitis		3	2.7	16.0	13.7	18.7
3. With pelvic parametritis or cellulitis and peritonitis		4	5.0	23.5	19.8	28.5
4. With sepsis		2	14.0	18.0	15.0	32.0
5. With pelvic abscess		3	8.3	30.0	26.0	38.3
A. Pelvic abscess treated, requiring no postceolpotomy	2					
B. Pelvic abscess, postceolpotomy before treatment	1					
A-1. Elliott treatment ordered to prepare patients for laparotomy. Elliott treatment given and laparotomy not performed	1	20				

TABLE II—Cont'd

CHRONIC SALPINGITIS, CAUSE, GONORRHEA, 53 CASES		NUMBER OF PATIENTS	AVERAGE NO. DAYS IN HOSPITAL BEFORE E.T. COMMENCED	AVERAGE NO. DAYS IN HOSPITAL FROM TIME OF FIRST E.T. UNTIL DISCHARGE	AVERAGE NUMBER E. T.	AVERAGE NO. DAYS IN HOSPITAL BEFORE AND DURING E. T.
1. Salpingitis or tuboovarian abscess		37	8.9	11.5	7.5	20.4
2. Pelvic cellulitis or parametritis		5	8.2	12.8	12.6	21.0
3. With pelvic abscess		16	13.6	14.8	11.4	28.4
A. Pelvic abscess, postecolpotomy before treatment	5					
B. Pelvic abscess treated, requiring later postecolpotomy	0					
C. Pelvic abscess treated, postecolpotomy not necessary	11					
A-1. Tuboovarian masses extending $\frac{1}{2}$ way or more to umbilicus						
B-1. Parametritis causing stony hard masses	2					
C-1. G. C. arthritis	2					
D-1. Elliott treatment ordered to prepare patients for laparotomy. Elliott treatment given and laparotomy not performed	16					
E-1. Warned to watch for ectopic	2					
F-1. Elliott later laparotomy	1					
CHRONIC SALPINXITIS, CAUSE, ABORTION, 14 CASES						
1. Salpingitis or tuboovarian abscess		6	7.0	6.5	4.8	13.5
2. With pelvic cellulitis or parametritis		4	26.5	5.8	5.5	32.3
3. With pelvic abscess		4	8.0	23.7	15.5	31.7
A. Pelvic abscess, postecolpotomy before treatment	2					
B. Pelvic abscess treated, postecolpotomy not necessary	2					
A-1. Tuboovarian masses extending $\frac{1}{2}$ way or more to umbilicus		—				
B-1. Parametritis causing stony hard masses	2	14				
C-1. Elliott treatment ordered to prepare patients for laparotomy. Elliott treatment given and laparotomy not performed	1					
D-1. Cases later becoming pregnant	2					
E-1. Warned to watch for ectopic	1					

acterized by exacerbations of salpingitis due to extension of infection from these foci, it behooves us to attack the organism from below, before attempting surgical intervention from above.

The severity of any disease depends on the virulence of the affecting organism and the resistance of the tissues attacked. Gonococci are only virulent under ideal conditions, for example, they will grow only on special nutrient agar, are killed by weak disinfectant solutions and by desiccation in thin layers. At its optimum temperature for growth and proper nutrition, the gonococcus however will live indefinitely. At a temperature of 106° it is killed in a few hours, and at 122° in ten minutes.

Therefore, in order to kill gonococci, the temperature must be raised sufficiently and its habitat, the glands, made as poor a culture medium as possible. Nature attempts to do this very thing, by an initial rise of body temperature and an increased glandular secretion, which persists until the attack is controlled.

The first factor, temperature, is taken care of by the Elliott apparatus which maintains a temperature of 130° in the vagina. The heat is radiated in all directions and we find the following temperatures are maintained in the pelvis of a patient with a normal mouth temperature, in the cervix proper 112°, on the anterior rectal wall 106°, posterior rectal wall 104.2°, in the urethral meatus 104°, and in the bladder proper 104.2°. All these temperatures are correspondingly higher in proportion to the original body temperature which rises only 0.4 of a degree with this treatment.

The second factor, the habitat of the gonococci is also altered by the Elliott treatment, which causes a change in the contour and activity of the glands. After only two treatments, one can notice an excessive secretion both from the vaginal mucosa and the cervix. The parts become soft, the cervix becomes shorter and broader, and the cervical canal wider. One may assume, therefore, the glands likewise become shorter and broader. At the same time that this change in contour takes place, there is a pouring out of the glandular substance which harbors the gonococci.

The same principles apply to the urethral and Skene's glands. We have noticed, however, that there are Skene's ducts which, because of their anatomic position and mucous tabs, do not have proper drainage, and as our results show, this type will not become organism-free as soon as other cases. In our experience a chronic Bartholinitis is not a common point of latency.

It is the experience of most clinicians that the gonococci are easily found in smears taken from the urethra and cervix in the acute stage of the infection, but the organisms are hard to find in the chronic stage. How then can we tell when a patient is cured? The comple-

ment-fixation test which has great promise, lacks a standard antigen and gonococci cultures require special laboratory facilities and technicians.

On the advice of Dr. Anna Williams of the New York City Research Laboratories, we obtained a trained technician who made "spreads" (not smears) from the cervix and urethra. The wire loop is spread across the slide only once and not smeared across several times. This gives a clearer microscopic picture with the leucocytes unbroken and the organism remaining intracellular. According to the microscopic picture of a well prepared spread, the cases are divided into four groups: (1) positive, (2) suspicious, (3) doubtful, or (4) negative, depending on the presence of morphologically typical gram-negative diplococci, the percentage of polymorphonuclear leucocytes, and the position of the organism.

Spreads are taken daily before treatment and the case is dismissed as tentatively cured if there were five negatives and one negative after a provocative test of silver nitrate. We found it essential to keep the patient in the hospital for this period of time to exclude the possibility of reinfection from her consort. She was then allowed home and spreads were repeated for the first three successive days following each menstrual period for three months. If a positive spread appeared after the first menstrual period, the process was again repeated, giving treatment daily until negatives appeared.

Following this procedure we have discharged 31 cases tentatively cured, requiring an average of 20.5 treatments for the urethra and 18.3 treatments for the cervix to obtain 5 consecutive negative spreads and one negative after a provocative test. No other treatment was given with the exception of a daily cleansing douche. These patients have all returned after menstrual periods for check-up spreads and were found to be negative, some as long as five months later.

In four cases, urethral spreads remained positive after 26 or more treatments. Cantherization of Skene's ducts with the nasal cantery was quickly followed by cure.

NUMBER OF DAYS IN HOSPITAL

Since the Elliott cases were so materially improved, one must know how long this took in comparison with our control series. Table III

TABLE III. AVERAGE NUMBER OF DAYS IN HOSPITAL

TYPE OF PATHOLOGY	ELLIOTT TREATMENT		
	FORMER TREAT- MENT BELLEVUE 1926-1927	BEFORE AND DURING TREATMENT BELLEVUE 1929-1930	FROM FIRST TREAT- MENT UNTIL DIS- CHARGED BELLEVUE 1929-1930
Acute salpingitis	27.2	21.3	13.2
Chronic salpingitis	24.3	19.4	10.8
Pelvic cellulitis	41.0	27.1	14.2
Pelvic abscess	31.8	29.9	19.1

illustrates that the time of hospitalization is never more in those cases having Elliott treatment. Although the pelvic abscess series averages the same number of days, only 13 per cent in the Elliott series required posterior colpotomy compared to 75 per cent under our former treatment.

CONCLUSIONS

1. By means of the Elliott apparatus a consistently uniform temperature of 130° can be maintained for any length of time against a large area of distended vagina, cervix, adjacent parametrium, and pelvic organs.

2. This application of heat causes a marked increase in pelvic circulation.

3. In our experience, it is an excellent treatment for gonorrhea because a temperature lethal to the gonococci can be easily maintained for an indefinite period of time, thereby clearing up the latent foci of infection which heretofore were so difficult to reach.

4. In cases of salpingitis, pelvic cellulitis, tuboovarian, or pelvic abscess, the marked increase in pelvic circulation causes a more rapid resolution in a shorter period of time than with any of our previous methods of treatment.

59 EAST FIFTY-FOURTH STREET.

Ottow, B.: Nature, Diagnosis, and Therapy of Aberrant Endometrial Growths of the Female Urinary Bladder. *Zentralbl. f. Gynak.* 53: 3330, 1929.

Two of the author's own cases, and 14 more from the literature are reported in considerable detail. Ages of the 16 cases varied from twenty-two to forty-eight years, but predilection lies in the decade from thirty-five to forty-five. Symptoms are: pain and smarting on urination in relation to menses with freedom from symptoms during the intermenstrual period. Occasionally there is pyuria, pollakuria, hematuria, and dysmenorrhea. Symptoms usually begin one or two days before the menstrual flow is established, and last about a week after its cessation. The course of the disease is chronic over a period of several years, with a gradual increase in severity of symptoms with each menstruation.

Diagnosis is based on three points: history, palpation of a tumor mass, or an ill-defined "resistance," and cystoscopic examination. The condition has to be differentiated from fibroma and myoma, carcinoma, chorionepithelioma, cavernous angioma, and varicosities. Clinically, the exact differentiation must depend on the cyclic variation with relation to menstruation of the cystoscopic appearance of the tumor.

Therapy cannot be prescribed didactically, but depends on the age of the patient, localization of the tumor with respect to other structures, its appearance, and its rapidity of growth. Total extirpation of the tumor, and operative and radiation castration are the possibilities.

WILLIAM F. MENGERT.

THE SURGICAL INDICATION IN ECLAMPSIA*

BY ONSLOW A. GORDON, JR., M.D., F.A.C.S., BROOKLYN, N. Y.

(From the Department of Obstetrics, Peck Memorial Hospital)

✓

THE question of the management of eclampsia is one upon which there still exists a wide difference of opinion. In some clinics every effort is used to remove the products of gestation as speedily as is possible, while in other clinics, of equal standing, the fetus is almost or entirely ignored as a factor in the disease. Not only is this true but I have seen the trend of popular therapeutics as related to eclampsia, swing all the way from accouchement forcé to a fixed rule of inactivity, at least in so far as the fetus is concerned. As is usual in instances of this kind, there is perhaps a midposition that is more logical than either extreme. It is with this in mind that I have reviewed approximately 800 consecutive deliveries done during the past four years. From this number 12 cases may be classified as pre-eclamptic and 8 as actually eclamptic. I appreciate the fact that statistical studies should be based only upon large series of cases. The cases under consideration however have been carefully studied and when viewed in conjunction with our present understanding of eclampsia, they may be used as a basis upon which a mode of procedure may be suggested.

The term eclampsia has been applied for years to a more or less definite acute toxemia of pregnancy, usually manifesting itself in the latter half of the gestational period. The most characteristic manifestation of eclampsia is convulsions, and the term is naturally associated with their occurrence. Closely allied to the actual eclamptic state is preeclampsia, which from every viewpoint, is eclampsia minus its most characteristic phenomena, convulsions. In this consideration of eclampsia, I will include preeclampsia, omitting all of the so-called nephritic toxemias and that type of case so well characterized by Stander¹ as low reserve kidney. It is not my intention to enter into a lengthy consideration of the various theories as to the etiology of eclampsia, nor to consider too much in detail the various laboratory findings, either histologic or biochemical, that are associated with eclampsia. A brief consideration of these topics is, however, necessary for a rational understanding of the management of the eclamptic patient.

As to etiology, no one of the hypothesis thus far suggested is entirely satisfactory. Zweifel³ has well termed eclampsia the disease of theories. Eclampsia does, however, seem to be in some way dependent upon the metabolism of the fetus, and also definitely related to maternal protein metabolism and intestinal hygiene.

*Read before the Brooklyn Gynecological Society, November 7, 1930.

The most characteristic histologic finding in eclampsia is the so-called hepatic lesion; a perilobular hemorrhage and liver cell necrosis. The work of Dieckmann⁴ of St. Louis, on the experimental production of this lesion and its relation to therapy is a recent advance of importance. There are associated renal changes, but the characteristic lesion of eclampsia is hepatic, although, even this is not a constant accompaniment.

From a clinical standpoint, the biochemical changes associated with eclampsia, are limited to a few abnormalities in the urine and blood. The urine usually shows large amounts of albumin, with hyaline and granular casts; these findings being associated with a definite arterial hypertension. The blood chemistry changes of note, are usually limited to a uric acid increase of from 5 to 9 mg. and a CO₂ combining power decrease to below 35 volumes per cent. The blood-sugar findings are not definite, although Titus and Dodds⁵ have demonstrated, what they term "a relative hypoglycemia" immediately preceding the convulsive seizures. They state that the general trend of the sugar content is downward; although for years it has been assumed that eclampsia is usually associated with a hyperglycemia. When the blood chemistry presents evidence of nitrogen retention, it is produced either by a primary renal condition or a renal condition directly resulting from the eclamptic toxemia.

Bearing in mind these facts: namely, that eclampsia is a definite toxemia, characterized chiefly by an acidosis and a relative hypoglycemia, the following course of treatment has been adopted.

The preeclamptic patient is subjected to cesarean section, under local or spinal anesthesia. This course is not to be confused with the various methods of accouchement forcé in vogue in the management of eclampsia some years ago. The suspected preeclamptic patient is hospitalized and is there carefully studied over a period of time varying from several days to a week or two; during this period of study dietetic measures are in force, intestinal hygiene is maintained and the patient is kept at rest by the liberal use of opium. If after this period of study, eclampsia seems to be impending, section under local or spinal anesthesia is performed. The section may be abdominal or vaginal. The choice depending chiefly upon the period of the gestation and the parity of the patient. Abdominal section is the operation of choice in the primigravidae at or near full term or in the multipara with a definitely viable fetus. Abdominal section will be indicated in the majority of cases for most of the severe cases of preeclampsia occur in primigravida at or near full term. Vaginal section may be the operation of choice where the fetus is definitely not yet viable. These cases are especially suited for spinal anesthesia, in that they are severely toxic, and the spinal anesthetic in no way increases the toxemia. They show a marked hypertension and the fall in blood

pressure usually associated with spinal anesthesia need cause no special concern. Section can be done more rapidly and with greater ease under spinal anesthesia than under either infiltration or block anesthesia and in this type of patient operative time is often a deciding factor. Prolonged conservatism in the management of the preeclamptic patient is a dangerous procedure, for once the eclamptic seizures have occurred the mortality ratio for both mother and child is greatly increased. Ultraconservatism therefore may resolve itself into a most radical attitude. Cesarean section, by abdomen or vagina and the consequent delivery of the fetus removes one of the most important factors in the production of the toxemia, fetal metabolism.

The actual eclamptic should, in my opinion, be treated more conservatively, for as a rule, once the seizures have begun the patient will go into labor in a short time and the uterus may be emptied by vagina with a consequent minimum of shock. The seizures having occurred, section by any method is exceedingly dangerous. Absolute rest should be maintained by the liberal use of morphine; the morphine not only diminishes the patient's irritability but also decreases the acidosis. This type of patient should also be given large amounts of dextrose intravenously. In doing this, one should bear in mind the excellent work of Titus⁶ in estimating the therapeutic dose of dextrose, namely 50 to 75 gm. In many instances dextrose is given in insufficient amounts, the attendant having a false sense of security in the mere fact that intravenous dextrose was given. As the eclamptic patient is usually edematous, the concentrated solutions of 25 or 50 per cent are to be preferred and the dose repeated at intervals as indicated. The liberal use of morphine and dextrose will usually control the convulsions, although, at times the use of magnesium sulphate solution intravenously may be necessary. McNeile⁸ is enthusiastic concerning its use, while Stander² is of the opinion that magnesium sulphate is a very dangerous drug because of the possibility of its producing further liver damage. Stander makes this statement after the experimental use of the drug intravenously on dogs. "As to the question of the use of insulin with dextrose, it seems but rational to accept the attitude of Titus⁷ and others; namely, that these patients are well able to care for a temporary hyperglycemia by the action of their endogenous insulin. Their glycogen deficiency requires dextrose and the dextrose should not be too rapidly destroyed by insulin. In the nondiabetic patient we have not used insulin."

Two characteristic case reports follow, the first, a definite eclamptic and the second considered preeclamptic.

REPORT OF CASES

CASE 1.—A twenty-one-year-old primigravida was admitted to Peck Memorial Hospital July 17, 1929 as preeclamptic. She had been on a low protein diet and regular saline catharsis for several weeks prior to her hospitalization. At 6 A.M.,

July 18, or about eighteen hours after her admission, she developed her first definite eclamptic convulsion. Spontaneous labor occurred either just before or coincident with this convulsion. During the day of July 18, this patient had, in spite of our treatment, eight convulsive seizures. The laboratory findings in this case were as follows: July 18, urine examination showed four-plus albumin with hyaline and granular casts. July 19, blood chemistry showed uric acid 7.48 mg., sugar 115 mg., creatine 2.14 mg., and a CO_2 combining power of 30. Her systolic blood pressure at the time of the first convulsion was 160. The treatment given this patient may be summarized as follows: She received one and a quarter grains of morphine during the first twenty-four hours following the onset of her convulsions. She was given two intravenous injections of 25 per cent dextrose during the first twelve hours following her first convulsion. The first dose being 50 gm., and the second 65. She continued in active labor throughout the day. At 6 P.M., July 18, vaginal examination showed complete dilatation, the membranes ruptured and the vertex almost on the perineum. At this time she was given nitrous oxide-oxygen-ether anesthesia, a median perineotomy was done, and low forceps applied to a left occiput anterior position. She was easily delivered of a living male child weighing 2,670 gm. Following her delivery she made a practically uneventful convalescence being discharged from the hospital, up and walking about in good general condition, on the thirteenth day postpartum. The baby was discharged from the hospital on the same day, in good general condition, weighing 2,640 gm.; and nursing at the breasts. This patient was seen again six weeks after delivery, at which time her systolic blood pressure was 128 and her urine examination essentially negative.

CASE 2.—A twenty-five-year-old primigravida was admitted to Peck Memorial Hospital April 6, 1929 with a diagnosis of preeclampsia. Her laboratory findings were as follows: Urine examination April 6 showed four-plus albumin with many hyaline and granular casts. At this time her systolic blood pressure was 150. Her blood chemistry on admission showed uric acid 6 mg., creatine 1.55 mg., sugar 135 mg., urea nitrogen 17.75 mg., and a CO_2 combining power of 40. She was placed on a lactofarinaceous diet. Free catharsis was established by magnesium sulphate and citrate of magnesia. Absolute rest was maintained by the liberal use of allonal and pantopon. Despite our eliminative efforts and diet, her systolic blood pressure remained high, varying from 150 to 180. Her urine findings remained unchanged. On April 9, three days after her admission, a classical cesarean section was done under spinal anesthesia, the operative time being twenty-four minutes. She was delivered of a living female child weighing 1,866 gm. During her immediate post-operative convalescence morphine was used freely. She made an uneventful recovery, being discharged from the hospital on the fifteenth day postoperative, up and walking about in good general condition. The baby was discharged May 22, taking a formula well and weighing 2,985 gm. This patient was seen when six weeks postoperative and at this time her systolic blood pressure was 124 and her urine examination essentially negative.

SUMMARY

1. Eclampsia is an acute toxemia of pregnancy, characterized biochemically chiefly by an acidosis and "a relative hypoglycemia."
2. Preeclampsia is eclampsia minus convulsions.
3. There is a definite surgical indication in preeclampsia.
4. Cesarean section, abdominal or vaginal, done under spinal or local anesthesia is a rational method of terminating the preeclamptic state.
5. Eclampsia should be considered a nonsurgical condition.

6. The therapeutic effort in eclampsia should be directed toward controlling the toxemia.

7. The toxemia of eclampsia may be controlled by the following means: (a) The liberal use of morphine. (b) Intravenous dextrose in sufficient amount. (c) Avoidance of active surgical procedures. (d) Early delivery without traumatism and the use of measures which decrease the acidosis.

REFERENCES

- (1) *Stander, H. J.*: New York State J. Med. 28: 2, 1928. (2) *Idem*: AM. J. OBST. & GYNEC. 13: 39, 1927. (3) *Zweifel, A.*: The Toxemias of Pregnancy, Baltimore, Williams & Wilkins Co. (4) *Dieckmann, W. J.*: AM. J. OBST. & GYNEC. 18: 6, 1929. (5) *Titus, P.*: AM. J. OBST. & GYNEC. 15: 3, 1928. (6) *Idem*: AM. J. OBST. & GYNEC. 16: 4, 1929. (7) *Idem*: AM. J. OBST. & GYNEC. 19: 1, 1930. (8) *McNeile, L. G.*: J. A. M. A. 87: 4, 1926.

71 HALSEY STREET.

(For discussion, see page 122.)

THE CONSERVATIVE TREATMENT OF ABLATIO PLACENTAE*

BY GEORGE KORNFELD, M.D., BROOKLYN, N. Y.

(From the Obstetrical Service of the Jewish Hospital)

DURING the years 1918 to 1928 inclusive, there have been delivered on the obstetric service of the Jewish Hospital 16,000 patients. In this series there were found 50 cases of ablatio placenta.

In reviewing the literature on premature separation of the placenta, we find that Rigby in 1775 was one of the earliest to differentiate between placenta previa and accidental hemorrhage.

Goodell in 1875 recognized that premature separation of the placenta and accidental hemorrhage are synonymous terms. Couvelaire and Williams were the first to describe placental apoplexy, and from their work the term "Couvelaire uterus" arose.

There are many terms applied to the premature separation of a normally implanted placenta. Those most often heard are, accidental hemorrhage, uteroplacental apoplexy, premature separation of the placenta, abruptio placental, and ablatio placentae. In this clinic we have adopted the term ablatio placentae.

The various clinics agree as to the frequency of this condition. Williams prior to 1915 in a series of 2,000 deliveries, had 17 mild cases of premature separation of the placenta, an incidence of 1-400, and only one severe case.

DeLee of Chicago Lying-In Hospital in reviewing 20,000 histories reported 14 cases of complete placental detachment and 35 cases of partial detachment or an incidence of about 1-300. Essen-Møller and Dorman in their large series of cases found that premature separation of the placenta occurred once in 200 cases. In our series of 16,000 deliveries the incidence was 1-420.

*Read before the Brooklyn Gynecological Society, November 7, 1930.

Ablatio placenta occurs most frequently in the third trimester of pregnancy and in multiparae more commonly than in primiparae. In Holmes' series only 19 per cent of the cases were in primiparae. Although in our series this relationship does not hold true, we find that of our 7 severe cases, 5 occurred in multiparae.

The consensus of opinion today is that there is a relationship between ablatio placenta and toxemia of pregnancy. We often find it associated with chronic nephritis or preeclampsia. Trauma, acute infection, torsion of the uterus, short umbilical cord, sudden rapid delivery of one twin, are also mentioned as occasional etiologic factors. Some go as far as to state that even strong emotional disturbances may separate the placenta. It is agreed by almost all workers that the cause of this entity is a specific toxin.

The specific toxin of this condition produces degenerative changes in the blood vessels of the spongiosa. The rupture of these vessels initiates the hemorrhage with the resultant placental separation.

Our understanding of the pathology of ablatio placentae has been clarified by the work of Braun, Young, Ley, Hofbauer and Williams. Hofbauer has shown that histamine poisoning will produce similar pathologic changes. Williams draws an analogy between the changes found in snake venom poisoning and ablatio placentae. The extreme type described by Couvelaire and Williams shows typical changes in the uterine musculature. The uterus in these cases resembles the picture of a twisted ovarian cyst with its purplish discoloration. Microscopically we find in these cases a separation of the muscle fibers by edema and hemorrhage, with resultant degeneration of the musculature. It is to this extreme picture that the term "Couvelaire uterus" is applied.

The symptoms of this condition vary with the degree of separation of the placenta. When most of the placenta has been separated, the onset is acute, the patient experiencing severe abdominal pain with or without external bleeding. This is accompanied by the classical picture of shock—marked pallor, profuse cold, clammy sweat, rapid thready pulse and anxiety. The uterus is found tonically contracted, tender, with board-like consistency. In concealed hemorrhage the uterus may be larger than the corresponding period of gestation. The fetal heart cannot be heard and fetal parts cannot be palpated. If it were not for the enlarged, tender, board-like uterus the patient would resemble the picture of a ruptured ectopic. The mild case may show only slight abdominal pain with or without external bleeding. Whereas this is a description of the two extremes, many cases may vary between these types, depending on the degree of separation.

In considering the diagnosis of ablatio placentae, it is usually necessary to rule out placenta previa. However, various authors also mention in the differential diagnoses, such conditions as ruptured ectopic.

threatened rupture of the uterus, intraabdominal injury and ruptured appendiceal abscess complicating pregnancy. In differentiating between ablatio placentae and placenta previa, we have in the former, the acute onset with pain, shock, board-like uterus, absence of fetal heart and difficulty in palpating fetal parts. On vaginal examination, no placenta can be felt. In many of the milder cases, the exact diagnoses cannot be established until after the examination of the placenta.

In the past eleven years from 1918 to 1928 there were 50 cases at the Jewish Hospital with the diagnosis of ablatio placentae. In this group, there were 38 cases in which the diagnosis could not be questioned; divided as follows: 20 mild, 11 moderately severe, and 7 severe. The diagnosis in the other cases was most likely correct but as there was some doubt in our minds in reviewing the charts, these histories were not included in our series.

In reviewing our series, the one outstanding feature was the conservative handling of the cases. Many of the mild cases dilated rapidly and therefore required only watchful waiting. Where judicious neglect was not deemed sufficient, rupture of the membranes with or without 2 to 3 minim doses of pituitrin was resorted to. In the more severe cases where dilatation was delayed, or where labor had not begun, a Voorhees' bag was inserted after rupture of the membranes. Patients admitted with shock and severe blood loss, require primarily morphine, rest, external heat, fluids and possible transfusion before treating the premature separation of the placenta. Even though classical cesarean section and hysterectomy are advocated by some authors in the recent literature, only one case in our series was sectioned, and this because of an erroneous diagnosis of placenta previa.

The results of the conservative treatment are best shown in the following tables:

TABLE I. PROCEDURE

No treatment	21 cases
Rupture of membranes with pituitrin	14 cases
Voorhees' bag	2 cases

TABLE II. TYPE OF DELIVERY

Spontaneous delivery	32 cases
Low forceps	4 cases
Version and extraction:	
transverse presentation	1 case
Cesarean section	1 case

Table III demonstrates the result of our conservative treatment. We had no maternal mortality and a low maternal morbidity using as a standard a temperature of 100.4 on two successive days, or a reading of 101 or over on any one day.

TABLE III. RESULTS OF TREATMENT

Maternal mortality	0
Maternal morbidity	7
No morbidity	31

Goodell reports maternal mortality of 50 per cent and Portes maternal mortality of 36 per cent.

The fetal mortality is reported by various others to range between 80 and 95 per cent (Goodell 94 per cent, Portes 81 per cent).

Table IV shows a fetal mortality of 60 per cent.

TABLE IV. FETAL MORTALITY

1. Born alive	15 (40 per cent)
(a) Full term	13
(b) Premature	2
2. Born dead	23 (60 per cent)
(a) Full term	13
(b) Premature	10

One of the two prematures born alive died shortly after birth.

The following case reports describe the morbidity of the cases in Table III:

CASE 1.—Para iii, aged thirty-three, at term. At 1 P.M. on April 27, 1927, patient began to have regular pains every ten minutes. Seven hours later pains every three minutes with slight staining. At 11 P.M. on admission to the hospital, profuse bleeding, patient pale, restless, moderate cyanosis of lips, pulse 132, thready.

Fetal heart not heard, cervix fully dilated, membranes intact, head in brim.

Membranes ruptured artificially; three minims of pituitrin were given by hypodermic; the head was pushed into midpelvis by abdominal pressure; midforceps were applied. There was no difficulty in delivery, stillbirth. Manual extraction of placenta and membranes. Placenta showed separation over three-fourths of its area. On the third day the patient developed paralytic ileus with gastric dilatation and was treated by repeated gastric lavage. Temperature was 102° F. on the fourth day, postpartum, lasting until the thirteenth day. About the fourth day the patient showed a beginning parametritis which had cleared up on the twenty-first day.

She was discharged on the twenty-fourth day in good condition with a diagnosis of ablatio placenta, paralyticileus, bilateral parametritis.

CASE 2.—Patient aged twenty-four, primipara, at term, was admitted on December 16, 1920 at 1:30 P.M.; having spotted slightly at home. At 3:30 P.M. the membranes were ruptured spontaneously with considerable bleeding. The cervix was fully dilated. At 4 P.M. she was having pains every two or three minutes. At 5 P.M. the patient bled considerably with caput visible. At 5:45 P.M. she was delivered spontaneously of a stillbirth. Considerable bleeding followed the expulsion of the baby. Placenta was expressed easily and showed picture of ablatio placenta. Temperature ranged between 100° and 101°, beginning on the third day and lasting four days.

CASE 3.—Patient aged thirty, primipara, at full term, was admitted to the hospital on September 30, 1927 at 8 A.M., with a history of slight staining and slight pains. At 1 P.M. there was moderate bleeding. At 5 P.M. the cervix was four fingers dilated and because of profuse bleeding, the membranes were ruptured artificially. At 10 P.M. a normal male infant was delivered by low

forceps. The placenta showed typical signs of premature separation. The patient ran a temperature of 101° on the twelfth, thirteenth, and fourteenth days postpartum. She was discharged on the twenty-first day with a diagnosis of ablatio placenta and slight parametritis.

CASE 4.—Patient thirty-two years of age, para iii, was admitted to the hospital on June 24, 1927, having shown signs of toxemia in the prenatal clinic. Blood pressure varied between 150 and 170 systolic with albumin and casts in the urine. At 10 A.M. on day of admission the patient noted considerable painless vaginal bleeding, felt weak and dizzy. On examination blood pressure was 186 systolic, no fetal heart heard. Abdomen did not reveal any signs of a board-like uterus. On vaginal examination no evidence of placenta previa was found, cervix was two fingers dilated, membranes were ruptured artificially and three minims of pituitrin were given by hypodermic. Patient delivered spontaneously of a normal living female infant. Placenta showed many areas of infarction and premature separation at the edge of the placenta. Patient had temperature of 101° on the second day and was discharged on the eleventh day.

CASE 5.—Primipara, aged twenty-eight years, at term, came into the hospital with a history of spotting. The membranes were found ruptured and a breech presentation. Pains in back and sides. Because of the breech presentation and a diagnosis of placenta previa, cesarean section performed. (Normal infant delivered.) The operative findings showed the uterus full of blood clots and a partial separation of the placenta. Patient ran a temperature of 103° for two days and developed a femoral phlebitis.

CASE 6.—Primipara, aged twenty-three years, admitted to the hospital with a history of seven months' pregnancy, slight pains and slight staining. On examination, the blood pressure was 165 systolic, uterus was tense, considerable vaginal bleeding but no pain. No fetal heart was heard. At 3 P.M. rectal examination showed no dilatation, considerable bleeding, uterus large and firm, tonically contracted. At 6 P.M. a number 4 Voorhees' bag was inserted after rupture of the membranes. At 10 P.M. the patient delivered of a premature stillbirth. Placenta was expressed and showed definite signs of premature separation. Patient ran a temperature of 101° for one day and 100.6° for one day. She was discharged on the twelfth day.

CONCLUSION

This series, though small in number, demonstrates that the conservative treatment of ablatio placentae gives far better results than the radical methods that are still advocated by various authors today. Our low maternal morbidity and absent mortality warrants one continuing the conservative treatment of ablatio placentae.

REFERENCES

- Magwood, S. J. N.: *Canad. M. A. J.* 16: 665, 1926. Hofbauer: *Bull. Johns Hopkins Hosp.* 38: 1926. Barker, E. O.: *J. Oklahoma M. A.* 20: 86, 1927. Wien. med. Wchnschr. 17: 1927. Hofbauer, J. I.: *AM. J. OBST. & GYN.* 14: 286, 1927. Greenhill, J. P.: *S. Clin. N. Am.* 6: 1107, 1926. Browne, J. F.: *Edinburgh M. J.* October, 1926. *AM. J. OBST. & GYN.* 1928. DeLee: *Obstetrics for Nurses*, Philadelphia, 1930, W. B. Saunders Company. Williams: *Obstetrics*, Ed. V, D. Appleton & Co., New York.

135 EASTERN PARKWAY.

(For discussion, see page 121.)



A CASE OF PLACENTA ACCRETA*

BY ARTHUR CHARLES TIEMEYER, M.D., F.A.C.S., BALTIMORE, MD.

PLACENTA accreta is a rare complication of pregnancy in which there is a more or less complete absence of the decidua basalis, and in which the chorionic villi invade the musculature of the uterus.

The following case is typical of placenta accreta and seems worthy of reporting:

Mrs. M. P., white, aged thirty-three years, para viii, was admitted to my service at the West Baltimore General Hospital, June 28, 1930, with a diagnosis of retained placenta. Six hours before admission, she was delivered at her home, by her family

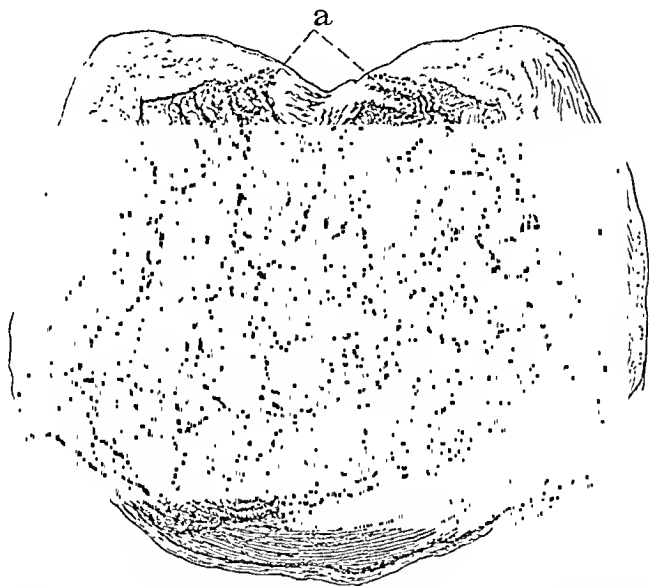


Fig. 1.—Drawing from the original photograph of placenta accreta, showing thinning of the uterine wall and invasion of the myometrium, particularly at the fundus (a). The placenta has been torn away but portions remain attached to the uterine wall.

physician, of a living female child of thirty-two weeks' gestation, which weighed 2048 gm. The labor lasted forty minutes. After two hours there was no placental separation and no bleeding. Several unsuccessful attempts were made to express it by Credé's maneuver and then manual removal was tried. Several pieces of placental tissue were removed but because of the inability to separate a large portion of the placenta and because of hemorrhage, further efforts to remove the remaining placenta were abandoned and the patient sent into the hospital, where another unsuccessful attempt at Credé's expression was made. Then, under nitrous oxide-ether anesthesia, the hand was introduced into the uterus and as no line of cleavage could be felt between the placenta and the uterine wall, a tentative diagnosis of placenta accreta was made. It was impossible to separate the placenta from the uterine wall and had attempts at removal been persisted in, portions of the uterine wall would have been torn away or the uterus perforated. The uterine wall at the

*Read before the Baltimore Gynecological and Obstetrical Society, October 24, 1930.

fundus was very thin. The patient was shocked and it was thought advisable to postpone operation until she had reacted sufficiently. The uterus was tightly packed and the patient returned to her bed. The following morning a supravaginal hysterectomy was done. Her convalescence was stormy but she made a good recovery and was discharged from the hospital on the twenty-seventh day after operation.

Pathologic report by Dr. Manuel Giehner, pathologist of the hospital:

Gross.—Specimen consisted of a postpartum uterus removed supravaginally and contained a large portion of the placenta densely adherent to the uterine wall, particularly at the fundus where the placenta was most densely adherent and seemed to invade the musculature.

Microscopic.—Sections prepared included the uterine wall and the adherent placenta. No evidence of decidua basalis was seen and in several areas notably at the fundus, chorionic villi invaded the underlying musculature and formed inter-



Fig. 2.



Fig. 3.

Fig. 2.—Photomicrograph x42, showing invasion of chorionic villi into the myometrium and an entire absence of the decidua basalis. The increased vascularity of the uterine wall is apparent. Some villi appear just beneath the peritoneum.

Fig. 3.—Photomicrograph x42, showing invasion of uterine wall by chorionic villi and the absence of decidua basalis.

digitations with strands of muscle. About these areas of invasion there was marked increase in circulation and considerable free blood in the tissues.

Diagnosis.—Placenta accreta.

The important points in her history were as follows: There were 8 pregnancies in fourteen years. All were normal except the seventh and the present one. The seventh pregnancy terminated from some undetermined reason at the twenty-eighth week and was complicated by retained placenta and sepsis. On the tenth day postpartum she was removed to a hospital; the uterus was curetted and portions of the placenta removed. Her convalescence was marked by twenty-seven days of fever and she remained in the hospital for thirty-six days following her operation. After her discharge from the hospital, she had a profuse leucorrhoea which lasted well into

her present pregnancy. Her menstrual periods were increased from six to ten days, although the flow was not more profuse than before the curettement.

There are varying degrees of placenta accreta. Sometimes there is only an absence of the decidua basalis but in other cases the chorionic villi invade the musculature of the uterus and occasionally actually become a part of the uterine wall. The characteristic feature of this condition is that there is no line of cleavage between the placenta and the uterus, because of the absence of the decidua basalis. The decidua basalis is made up of two layers, a compact layer, superimposed upon a spongy layer. The latter adjoins the muscular wall of the uterus. It is in the spongy layer of the decidua basalis that the placental separation takes place. Hence, in the absence of this decidua, normal placental separation cannot take place.

In some cases, as in the one here reported, the uterine wall is thin and evidence of degenerative muscular changes in the vicinity of the invading villi are seen. Because of this thinning, the uterine wall is weakened and rupture has been a frequent complication. Cases have been reported by Klaften,¹ Klosterman,² Dietrich,³ and others.

Nathanson⁴ has suggested that the term accreta be applied to those cases where there is an insufficient development or an entire absence of the decidua basalis, and increta when there is an invasion of the myometrium by the chorionic villi. Placenta accreta, however, is the term used by the majority of the authors and will be used throughout this paper.

The incidence of placenta accreta varies in the different clinics. Polak⁵ found it once in his 6,000 cases and B. C. Hirst once in 40,000. J. Whitridge Williams has seen one case in the 40,000 patients delivered on his service in the Johns Hopkins Hospital. Nathanson⁴ in 1928 reviewed the literature and found only 36 cases on record. Since then Blagadarow,⁶ Klostermann,² Reeb⁷ and Wilson,⁸ have each reported a case and with the one here reported, there has been a total of only 41 cases in the literature.

In all cases reported, placenta accreta has occurred in women who have previously borne children or who have had an abortion followed by curettement or sepsis. The rapidity with which the pregnancies occurred had some relationship to the frequency of this abnormality. In cases of severe curettement or where the endometrium has been more or less destroyed by infection with an invasion of connective tissue, normal decidual reaction does not take place. A normal endometrium is necessary for the proper development of the decidua. Other factors, however, enter into the formation of the decidua and one cannot say that previous pregnancy was necessary for the development of placenta accreta. It is believed that the hormones from the corpus luteum control the formation of the decidua, and abnormalities of the corpus luteum may have some bearing on the

formation of this condition by producing a defective decidua basalis. A uterine diverticulum and submucous fibroids have been mentioned as causes. Syphilis has not been mentioned as an etiologic factor in any of the reported cases.

The diagnosis cannot be made until the placenta fails to separate and the interior of the uterus explored. It will then be found that no line of cleavage exists and that the placenta cannot be removed from the uterine wall without tearing away a portion of the uterus. Unless the placenta is torn during efforts to remove it, there will be no hemorrhage, because there has been no placental separation. The final diagnosis can only be made by microscopic examination of that portion of the uterus where the placenta is attached and by finding an absence of the decidua basalis and an invasion of the musculature by the chorionic villi.

The prognosis is grave because of the liability of rupture of the uterus and hemorrhage during attempts at removal of the placenta, and also from subsequent sepsis. There are comparatively few cases on record where the diagnosis was made in the living woman, most of the conditions having been recognized only at autopsy. Very few cases are on record where the patient recovered, and this case is one of them.

There appears to be only one logical treatment for this abnormality and that is hysterectomy. Because of the thinning of the uterine wall, manual removal of the placenta or curettement is dangerous because of the possibility of perforation of the uterus. When the placenta fails to separate in the absence of hemorrhage, it is safe to wait several hours for the delivery of the placenta. Then one may attempt to express it by Credé's maneuver or by the Mojon-Gabaston method and if unsuccessful, the gloved hand should be introduced into the uterus with the strictest aseptic technic. If no line of cleavage can be found, the hand should be removed without attempting to separate small pieces of the placenta, the uterus tightly packed and, as soon as convenient or as soon as the condition of the patient justifies it, a supravaginal hysterectomy should be performed. If considerable blood has been lost from partial detachment of the placenta, it would be better to transfuse the patient before or at the time of operation.

SUMMARY

Placenta accreta is a rare complication of pregnancy and there have been reported only 41 cases. The characteristic features of this abnormality are an absence of the decidua basalis and an invasion of the musculature of the uterus by chorionic villi. The dangers are perforation of the uterus, hemorrhage, shock and sepsis. Rupture of the uterus may occur during the latter part of pregnancy. The prognosis

is grave because the diagnosis is not often made before serious complications have resulted, and instrumental removal of placenta is usually followed by perforation of the uterus.

Supravaginal hysterectomy offers the best prognosis and should be done in preference to manual removal or curettement of the uterus.

REFERENCES

- (1) *Klaften, E.*: Arch. f. Gynäk. 135: 190, 1928. (2) *Klostermann, H.*: Med. Klin. 25: 713, 1929. (3) *Dietrich, H. A.*: Ztschr. f. Geburtsh. u. Gynäk. 84: 579, 1921-22. (4) *Nathanson, J. N.*: AM. J. OBST. & GYNEC. 16: 44, 1928. (5) *Polak, J. O., and Phelen, Geo. W.*: Surg. Gynec. Obst. 38: 181, 1924. (6) *Blagadarow, A. A.*: Zentralbl. f. Gynäk. 53: 2671, 1929. (7) *Reeb, M.*: Gynec. et Obst. 17: 81, 1928. (8) *Wilson, R. A.*: AM. J. OBST. & GYNEC. 17: 58, 1929. (9) *Sussig, L.*: Minerva Med., Torino 9: 708, 1929.

207-8 MEDICAL ARTS BUILDING.

(For discussion, see page 127.)

AN ANALYSIS OF 115 CASES OF PLACENTA PREVIA*

BY ISADORE A. SIEGEL, A.B., M.D., BALTIMORE, MD.

(From the Obstetrical Department, University of Maryland Medical School)

PLACENTA previa and its treatment is an obstetric problem which still demands the serious consideration of the profession. This fact is emphasized by the great maternal as well as the great fetal mortality which occurs in this complication. This is particularly true when the older methods of treatment, such as bagging, internal podalic version, and breech extraction are employed.

Let us consider the mortality figures for placenta previa treated by the vaginal route as reported in the literature.

Hitchmann in a study of 5868 cases of placenta previa collected from various European Clinics reports a total maternal mortality from all causes as varying from 9.3 per cent to 38 per cent with the lowest maternal rate of 3 per cent in the partial type. The Johns Hopkins Clinic in a study of its cases for a period of twenty-three years gives a gross mortality of 8 per cent. McPherson in his report gives a mortality of 12.1 per cent; Broadhead 9 per cent; Munro Kerr 11.5 per cent to 13 per cent; Doederlein 19 per cent; Kronig 18.2 per cent; Miller 20 per cent; and Chacoloris 15.5 per cent. Kellogg in a report of 303 cases over a period of fifteen years, in which the bag was the principal method of treatment, concludes that this form of handling placenta previa cannot reduce the maternal mortality to less than 6 per cent. Statistics as to the fetal death rate in placenta previa treated by the vaginal route varies from 40 to 90 per cent. These data from various parts of the world must be considered as reliable evidence that this so-called conservative method treating placenta previa is not productive of happy results for either the mother or the child.

When we further consider the actual causes of the maternal mortality following vaginal delivery, we are impressed with the great

*Presented at a meeting of the Baltimore Gynecological and Obstetrical Society, October 24, 1930.

number of deaths due to ruptured uteri, as well as those due to hemorrhage either from the relaxation of the lower uterine segment or from atonic uteri. Hitchmann in his report states that 33 per cent of the deaths were due to ruptured uteri and that deaths from bleeding due to relaxation varied from 1.3 per cent to 15 per cent. Kellogg reports that 50 per cent of his deaths were due to ruptured uteri. Depkin found that about one-third of his deaths were due to bleeding from lacerations. Von Mikulicz states that 75 per cent of his deaths could be attributed to hemorrhage. These deaths from ruptured uteri and hemorrhage we believe can be and should be avoided.

In investigating the cause for this high mortality in placenta previa due to ruptured uteri and hemorrhage, Sellheim, Krönig, Bill, Kellogg, and others believe that the factor lies in the structure of the lower uterine segment. The implantation of the placenta in the lower uterine segment and about the internal os produces a very thin, friable and very vascular condition of this part of the uterus. When this placental site is stretched to permit the delivery of the child per vaginam, the danger of rupture through this thin muscular and highly vascular area is always imminent. In addition to this the contractility of the lower uterine segment is destroyed or impaired and this loss favors postpartum hemorrhage. If these facts are true, as they seem to be, we must look to a method of delivery which will avoid these accidents, and which will reduce this great maternal and fetal mortality in the greatest number of cases of placenta previa.

Cesarean section has been advocated by many writers as the best hope for avoiding these accidents and for obtaining better results for the mother, as well as for the child. They believe that by this operation the placental site is not disturbed and that the contractility of the lower uterine segment remains uninjured, so that neither rupture of the uterus nor postpartum bleeding is apt to occur. In addition to this the fetal mortality, even in those cases where the fetus is premature, has been reduced to 21.9 per cent, although DeLee states that cesarean operation has reduced the fetal mortality from 50 per cent to 5 per cent.

Do the figures on placenta previa treated by cesarean section confirm this belief that the maternal mortality can be reduced? In Table I we have collected from the literature 759 cases of placenta previa treated by cesarean section, giving a gross mortality of 3.16 per cent. The individual maternal death rate varies from 0 to 9 per cent in this series. Winter collected 745 cases of placenta previa from the various clinics in Europe which were treated by cesarean section giving an operative mortality of 3.9 per cent and a gross mortality of 5.9 per cent. These gross mortality figures for placenta previa treated by cesarean section are far better than the gross figures for the vaginal deliveries.

TABLE I

WRITER	NO. OF CASES	NO. OF DEATHS	PER CENT
DeLee	42	0	0
Bill	57	1	1.78
Frey (Zurich)	88	1	1.14
Proceedings Royal Society	19	1	5.26
Willett	14	1	7.1
Munro Kerr	17	0	0
Von Mikulicz-Radecki	31	1	3.3
Irving	57	2	3.5
Hitchmann	191	7	3.6
Welz	14	0	0
Stoekel	31	1	3.0
Schweitzer	11	0	0
Depkin	11	1	9
Gordon	98	7	7
Lull	5	0	0
Quigley	5	0	0
Humpstone	10	0	0
Siegel (University of Md.)	45(+13 in 1930)=58	1	1.72
Total	746(+13)=759	24	3.16

When should cesarean section be employed in the treatment of placenta previa? There are some authorities who believe that cesarean operation should be limited to the central type occurring in primiparae with an undilated cervix and with a viable child near term. On the other hand, such writers as Dr. Bill of Cleveland advocate this operation in all types of placenta previa where the cervix is undilated but insist that the best results can be obtained when prophylactic blood transfusions are employed prior to operation. In a previous paper on this subject we advocated cesarean section as a more conservative method of treatment for placenta previa. We found after a study of our own cases that we were able to reduce our maternal, as well as our fetal mortality, by this procedure. Since that report we have been employing cesarean operation more and more in all types of placenta previa, in which the cervix is closed and the uterus contains a viable child, with gratifying results.

From 1920 to 1929 inclusive we treated in the Obstetrical Division of the University Hospital 115 cases of placenta previa; of this number 77 were white and 38 negro patients. The age of the youngest was fourteen years and the oldest fifty-one years. Sixty-four cases occurred between the ages of fourteen and twenty-nine. Forty-five occurred between thirty and thirty-nine and six between forty and fifty-one. The largest number of pregnancies occurring in any one case was 18 with an average number of 4.56.

As to the duration of pregnancy: 31 cases occurred prior to thirty-six weeks' gestation; 26 between thirty-six and thirty-eight weeks; 56 between thirty-eight weeks and term, and in 2 cases the duration of pregnancy was not noted.

The central type of placenta previa was found in 36 cases; the marginal type in 48; the lateral type in 22; the low implantation in 3, and in 6 cases the type was not noted.

In the treatment of placenta previa we employed internal podalic version and breech extraction in 47 cases, after having first inserted a bag or by completing the dilatation of the partially dilated cervix. Breech extraction alone was done in 4 cases; forceps in 3; spontaneous delivery in 16, and cesarean section in 45 cases. Since this report we can add 13 more sections giving a total of 58 cases.

The gross maternal mortality for all cases was 7 deaths or 6.08 per cent. Seventy cases were treated by the vaginal route which resulted in 6 deaths, a mortality of 8.57 per cent. In these 6 patients internal podalic version and breech extraction was done. One death or 1.72 per cent followed cesarean section. In the 6 fatal cases delivered by the vaginal route, 5 were due to hemorrhage and one to ruptured uterus. The one death following cesarean section was due to puerperal infection.

The gross fetal mortality for all cases was 52 or 44.86 per cent. In the 70 patients delivered vaginally 44 or 62.08 per cent of the babies were lost, while 8 or 17.39 per cent of the babies died following cesarean section. Of the babies delivered by the vaginal route, 19 were premature stillborn; 19 were born alive prematurely and died before leaving the hospital, while 13 were full term, stillborn. The interesting feature in this study lies in the cesarean section babies. In spite of the fact that 22 were premature, ranging from twenty-eight to thirty-seven weeks, all but 4 of these babies were discharged from the hospital alive. If we group the babies born by cesarean section between thirty-four and forty weeks, we have 41 such babies with only 6 fetal deaths, 5 due to prematurity and one full term congenitally malformed. These figures indicate that many premature babies can be saved without compromising the mother. In Table II one can see at a glance the apparent advantage of cesarean section in indicated cases over the vaginal method of delivery both for the mother and the child.

TABLE II. SUMMARY FOR ALL CASES

TREATMENT	NO. CASES	MATERNAL MORTALITY	FETAL MORTALITY
Internal podalic and extraction	47	6 or 12.77%	29 or 61.7 %
Breech extraction	4	0	3 or 75.0 %
Forceps	3	0	1 or 33.3 %
Spontaneous	16	0	11 or 68.75%
Cesarean section	45 (& 13)	1 or 1.72	8 or 17.39%
Total	115	7 or 6.08%	52 or 44.86%

In Table III we report 70 cases of placenta previa delivered by the vaginal route, showing the various types of placental implantations and the number of deaths occurring in each type. This study seems

to indicate that the central type of placenta previa gives the greatest maternal death rate, although the other types may give the same unhappy results. A fact of greater importance, however, is that the method of delivery perhaps is the real cause of the large mortality. In Table IV, where we report the types of placenta previa for which cesarean section was performed, we find that the type of placenta previa has no particular bearing on the good results.

TABLE III

METHOD OF DELIVERY	TYPES		DEATHS
Vaginal deliveries			
70 cases	Central	15	2
	Marginal	28	1
	Lateral	19	1
	Low implantation	2	0
	Not typed	6	2
	Total		6 or 8.57%

TABLE IV

METHOD OF DELIVERY	TYPES		DEATHS
Cesarean section			
45 cases	Central	21	1
(43 classical	Marginal	20	0
1 low cervical	Lateral	3	0
1 porro)	Low implantation	1	0
	Total		1 or 2.2%

The study of these cases has produced nothing new in regard to the incidence of placenta previa, its etiology and the frequency of the various types. However, this study does seem to impress us with the value of cesarean section in all types of placenta previa where the cervix is closed and the fetus viable. The study further shows that the vaginal method of delivery in these cases should be relegated to the marginal and lateral types of placenta previa where the cervix is dilated or easily dilatable, where the fetus is nonviable and where there is evidence of infection.

We firmly believe that our success in the use of cesarean section in the treatment of placenta previa lies in the fact that we insist upon an early diagnosis and an immediate emptying of the uterus. Any case in which painless bleeding occurs in the last trimester of pregnancy, without obvious explanation, is considered by us *prima facie* evidence of placenta previa unless otherwise proved, and we immediately make the necessary examinations to confirm the diagnosis. The moment the diagnosis is made we empty the uterus without delay. Placenta previa is one condition in which delay in delivery may mean serious or even fatal bleeding. Too often have we seen patients with placenta previa who have bled but little and appear in excellent con-

dition, and for that reason delivery is postponed. Then, suddenly, without any warning the patient has a profuse and serious hemorrhage. A woman having a placenta previa should not be temporized with because an apparent additional small hemorrhage may prove fatal. We further maintain that no cesarean section should be done without first having fortified the mother with a preoperative blood transfusion in those cases where hemorrhage has been marked, or by the giving of fluids by hypodermoclysis or intravenously when suitable donors cannot be secured. Neglect to carry out this important measure will spell the difference between success and failure. We believe, with Bill of Cleveland, that the proper preoperative preparation of these patients will continue to reduce the maternal and fetal mortality in placental previa by the use of cesarean section. In our series of cesarean sections we have packed the uterus postoperatively in only one case, and we have not had a single postpartum hemorrhage. This we believe is due to the fact that the patient is fortified preoperatively by blood transfusion and fluids, which prevent an atonic uterus and that the placental site and the contractility of the lower uterine segment are not disturbed.

We do not advocate cesarean section in the interest of the child but, since this procedure diminishes the risk for the mother, we ought to consider the child as well. The high fetal mortality which occurs in the vaginal deliveries cannot be attributed primarily to prematurity, but rather to asphyxiation from hemorrhage and to physical injury inflicted on the premature fetus in dragging it through a crowded pelvis. We agree with Watson who says, "even when the child is premature cesarean section offers a better chance of life than any other form of delivery so that if pregnancy has advanced beyond thirty-four weeks it must be considered from this point of view. Yet, when we use a bag in a case of central placenta previa and especially when we do an early version and bring down a leg, using the child as a plug, we are sacrificing it almost as deliberately as when we do a craniotomy." Our figures show that by cesarean section we have reduced the fetal mortality to 17.39 per cent and if we consider only those cases beyond thirty-four weeks our fetal mortality is only 14.3 per cent.

CONCLUSIONS

1. The routine treatment of placenta previa by the vaginal route continues to give a high maternal and fetal mortality.
2. Cesarean section performed early, with prophylactic blood transfusions and preoperative fluids in all cases of placenta previa when the cervix is closed, seems to be the method of choice in the interest of the mother, as well as the child.
3. The vaginal method of delivery should be restricted to those

cases of lateral and marginal types of placenta previa where the cervix is dilated, fetus nonviable and patient potentially infected.

4. Most premature fetuses can be saved in indicated cases of placenta previa when cesarean section is employed.

I wish to express my appreciation and thanks to Drs. J. M. H. Rowland and Louis H. Douglass for their many suggestions and advice in preparing this paper.

REFERENCES

- Bill, A. H.*: AM. J. OBST. & GYNEC. 14: 523, 1927. *Idem*: Trans. Am. Gynec. Soc. 52: 40, 1927. *Broadhead, G. L., et al.*: Surg. Gynec. Obst. 32: 55, 1921. *DeLee, J. B.*: W. B. Saunders Co., 1927. *Depkin, H.*: Zentralbl. f. Gynäk. 48: 298, 1924. *Douglass, L. H., and Siegel, I. A.*: AM. J. OBST. & GYNEC. 15: 671, 1928. *Gordon, C. A.*: Ibid. 16: 307, 1928. *Greenhill, J. P.*: Surg. Gynec. & Obst. 1: 113, 1930. *Hitchmann, F.*: Die Therapie der Placenta Praevia, 1921. *Irving, F. C.*: Surg. Gynec. Obst. 14: 834. *Kellogg, F. S.*: AM. J. OBST. & GYNEC. 2: 194, 1926. *Lull, C. B.*: Ibid. 17: 403, 1929. *Miller, C. Jeff*: New Orleans M. & S. J. 77: 370, 1924. *McPherson, R.*: AM. J. OBST. & GYNEC. 7: 403, 1924. *Munro, Kerr*: Brit. M. J. 2: 516, 1921. *Quigley, T. K.*: AM. J. OBST. & GYNEC. 17: 597, 1929. *Von Mikulicz-Radecki*: Arch. f. Gynäk. 85: 581, 1923. *Willett, J. A.*: Proc. Royal Soc. Med. 18: 90, 1925. *Winter, G.*: Zentralbl. f. Gynäk. 58: 1874, 1929. Personal Communication, Obstetric Department, Johns Hopkins Hospital.

1704 EUTAW PLACE.

(For discussion, see page 128.)

Ottow: Deep Phlegmon of the Thigh Following Extension of a Parametrial Infection Through the Obturator Foramen. Zentralbl. f. Gynäk. 53: 2843, 1929.

This report concerns a deep phlegmon of the outer surface of the thigh reaching halfway to the knee, and of the inner surface of the same thigh, however of smaller extent. The patient, a thirty-two-year-old para ii had a chronic infection and swelling of both labia majora for four years. The right side healed. Pregnancy ensued, and at four months the infected area on the left was excised. There followed abortion with chills, fever, and septic, pyemic condition three weeks after excision. Examination showed the pelvis to be normal except for a hen's egg-size area of dense resistance on the anterior pelvic rim in the region of the obturator foramen extending to, but not reaching the uterus which was small and movable. There was a free zone between this thickening and the uterus. The left labium showed an edematous, elephantine swelling. Phlegmons developed as described, and in addition there was edema and thrombophlebitis of the deep veins of the leg. Patient died. Autopsy showed multiple metastatic abscesses of the lungs. The author traces the course of the infection as follows: puerperal infection following abortion, after excision of labial area of infection; blood-borne infection with localization at the brim of the pelvis in the tissues around the obturator artery; from thence, direct extension through the obturator foramen and the ischiadic foramen to the tissues underlying the gluteal musculature, and deep in the adductor musculature. The prognosis of such phlegmons is very dubious.

WILLIAM F. MENGERT.

HEMORRHAGE FROM A RUPTURED VARICOSITY IN THE PLACENTA CAUSING THE DEATH OF THE FETUS*

By MORRIS LEFF, M.D., NEW YORK, N. Y.

THERE is no mention made in any textbook on obstetrics of this condition and only one other similar case has been reported.

Mrs. M. S., aged thirty, married eight years. Two years ago, she aborted in the third month. She became pregnant again and went through a normal antepartum period.

On July 22, 1930 at 11 P.M. she was admitted to the hospital in labor at term. Her pains were slight and infrequent. Her condition was good. The fetal heart was 130. Vaginal examination disclosed the cervix to be one finger dilated, membranes intact, the head presenting. She continued to have slight pains and slept during the intervals. At 2 A.M. while dozing she had a pain and with it there was a gush of blood from the vagina.

A vaginal examination was immediately made to determine the cause of the bleeding. The cervix was found to be two fingers' dilated, the membranes apparently ruptured, the head in midpelvis. There was no evidence of placenta previa. The fetal heart sounds were rapid and feeble and in about five minutes they disappeared entirely. The patient's pulse was 80, and her general condition was good. The abdomen was soft, the uterus was not tender or rigid.

As the fetus was dead and the condition of the mother was normal, there did not appear to be any indication for interference and the labor was allowed to progress spontaneously.

The bleeding did not recur, with the exception of small squirts after each pain. The labor progressed regularly, the pains later becoming stronger, and the patient delivered a dead fetus at 10 A.M., six hours after the bleeding.

The placenta was expressed in about three minutes, with just a few small blood clots and little fresh bleeding. It was of medium size, well formed, and had no sclerotic areas due to infarcts. The maternal surface had no adherent blood clots, no indentations and no other evidence of premature separation. The cord was attached a little off the center of the placenta, of medium length, and showed no abnormalities.

However, when the fetal surface of the placenta was examined, it showed several patches of thin layers of old blood under the amnion. On the strength of that, it was suspected that the bleeding must have occurred from that side of the placenta. The exact site of the bleeding could not be determined on inspection. In order to locate the bleeding point, a syringe and needle was used to inject the umbilical vein with water. The water promptly passed out from a little opening on the fetal surface of the placenta, which evidently was the site from which the hemorrhage had occurred. The lesion was a rupture of a small varicosity about 2 mm. in diameter, located about 3 cm. from the periphery on the fetal surface of the placenta (Fig. 1).

From this finding we may infer what had happened. There was a small varicosity in one of the veins on the fetal surface of the placenta. It withstood the tension as long as the membranes were intact. The amniotic fluid exerting counter pressure against the vessels during the pains; but when the membranes ruptured, that counter pressure was gone and the varicosity ruptured. We therefore had the gush of blood simultaneously with the rupture of the membranes.

*Presented before the Section of Obstetrics and Gynecology of the New York Academy of Medicine, November 25, 1930.

It is evident that the blood loss was entirely fetal, none of it coming from the mother. That is why the hemorrhage promptly caused the death of the fetus, while it had no effect on the mother. When the fetal heart stopped beating the bleeding ceased, and only a little blood squirted out with each contraction of the uterus.

What to do at the time of the hemorrhage, was the problem to decide. The first consideration of placenta previa was ruled out by a vaginal examination. The next was to consider an extensive separation of the placenta which would account for the sudden death of the fetus. As the condition did not warrant interference, the policy of letting the labor proceed normally proved to be the proper procedure.

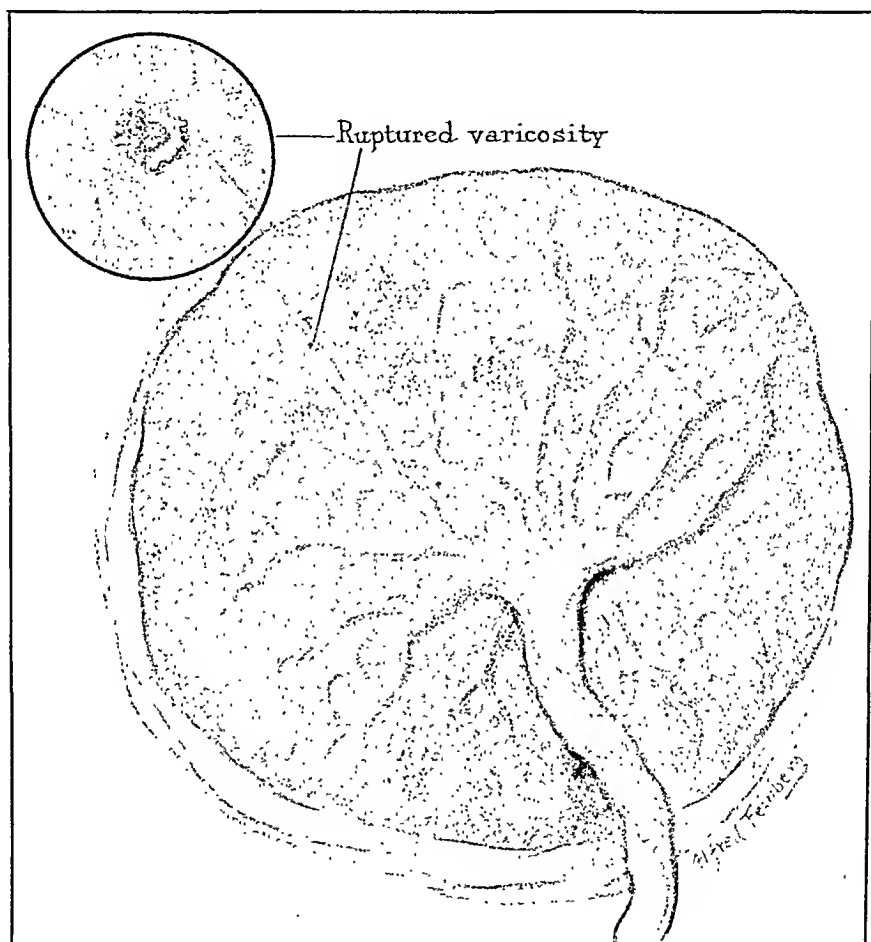


Fig. 1.—Fetal surface of placenta showing ruptured varicosity; and some blood clots under amnion.

There is one other condition that had to be considered which resembles this case, and that is a rupture of a velamentous cord. Kosmak¹ reported two such cases in 1922 and 1928.

The only other case in the literature of a rupture of a varicose vein in the placenta was reported by Rannenberg² in 1924.

REFERENCES

- (1) Kosmak, Geo. W.: AM. J. OBST. & GYNEC. 4: 619, 1922; 16: 438, 1928.
- (2) Rannenberg, Elly: Zentralbl. f. Gynäk. 48: 30, 1924.

15 EAST ONE HUNDRED AND ELEVENTH STREET.

Society Transactions

PHILADELPHIA OBSTETRICAL SOCIETY

MEETING OF NOVEMBER 6, 1930

DR. WALTER F. HARRIMAN presented a report of a case of **Pedicated Cystic Fibromyoma Arising From the Fundus Uteri Removed Postpartum.**

Mrs. D. M., the patient, a thirty-year-old primipara, from whom this tumor was removed on the seventh day postpartum was first seen by Dr. Longaker on April 3, 1930.

Married seven years, sterile (by design). Her last regular menstrual period, as always painful, had occurred on December 27, 1929. Her habit was of the twenty-eight-day type, flow lasting four days. On the twenty-fifth of January, the twenty-third of February, and on about the twentieth day of March there was a free gush of blood painlessly expelled, but at none of these dates did the bleeding continue more than a part of one day.

Pelvic examination confirmed the diagnosis of a three months' pregnancy, complicated by retroversion.

A week later Mrs. M. again came to the office complaining of a chocolate brown discharge and pelvic distress. While in the knee-chest position a retrouterine tumor the size of a grapefruit was dislodged from the culdesac.

Rest, sodium iodide and bromide tided her over the threatened danger of aborting.

On September 9, 1930, the thirty-sixth week of gestation, a five-pound girl baby was born without special incident.

The tumor at that time was the size of an average fetal head, in the right upper quadrant, and attached to the midfundus by a stout short pedicle. Its surface was perfectly smooth and hard, not painful on pressure. On the following day the mass had moved into the left lumbar region. Surmounting the fundus it had occasioned no difficulty during the partum or postpartum period.

On the sixth day, this mass which proved to be a cystic fibroid, was removed. Its pedicle the size of a thumb sprang from the fundus. There was an extensive fan-shaped omental adhesion to the upper surface of the tumor. The base of the pedicle was excised from the uterine wall by a wedge-shaped incision. Suturing this incision was like putting sutures through cheese; they cut out. Hemostasis, nevertheless, was satisfactory. From this viewpoint an early postpartum operation would have offered less risk and less difficulty. The patient made a perfect convalescence and left the hospital in fifteen days. Within a month she was readmitted to the hospital and a gangrenous appendix removed. Drainage followed, convalescence was perfect.

The tumor was a cystic fibromyoma in our opinion although another pathologist made a microscopic diagnosis of sarcoma.

DR. J. V. KLAUDER AND DR. HERMAN BROWN presented a paper entitled **A Study of the Calcium-Phosphorus Ratio in the Serum of Syphilitic Pregnant Women.** (For original article see page 60.)

ABSTRACT OF DISCUSSION

DR. HERMAN BROWN.—For some years we have been interested in calcium potassium and calcium-phosphorus ratio studies, especially in relation to syphilitic pregnant women, and especially in view of the fact that calcium-phosphorus metabolism is observed in pregnancy and is intimately concerned with those cases that are congenitally syphilitic. There is undoubtedly a definite connection in such cases, so it seemed reasonable that the syphilitic involvement may be associated with the observation of the calcium-phosphorus metabolism in the syphilitic mother.

Accordingly we selected ten patients in each of four groups, comprising, as a matter of control, syphilitic nonpregnant women, syphilitic pregnant women, normal pregnant women, and nonchildbearing women who were not syphilitic. White as well as colored were included. Wassermann tests were made in all cases.

Very few studies have been made of calcium phosphorus in pregnancy. It is the consensus of opinion of most investigators that calcium shows very low normal figures in pregnant women compared with nonpregnant women.

It is interesting to note in this connection that Dr. Blair Bell, of the Royal Infirmary, Liverpool, routinely prescribes large amounts of calcium lactate for pregnant women.

DR. A. CANTAROW.—The subject of mineral metabolism in pregnancy has received considerable attention during the past few years. It is the consensus of opinion of most observers that the serum calcium gradually diminishes during the course of pregnancy. This has been ascribed to two factors:

1. The growing demands of the fetus, which, increasing from about 6 mg. of calcium daily in the first four months to about 600 mg. daily at term, place an excessive burden on the maternal organism.
2. An actual retention of calcium and phosphorus by the maternal tissues, in amounts far greater than can be accounted for by fetal utilization. This retention is most marked in the later months and occurs in association with the diminution in serum calcium.

This phenomenon perhaps represents the establishment of a calcium reserve which may be called upon during subsequent emergencies, one of which is lactation. The transition from pregnancy to lactation is characterized by a decided alteration in mineral metabolism, a change from a markedly positive calcium balance to an equally marked negative balance. The loss of calcium occurs not only in the milk, but also in the feces, the fecal calcium content at times exceeding the calcium intake.

It is believed by some that these alterations play an important part in the development of osteomalacia, maternal tetany and eclampsia.

In dealing with ratios between various inorganic constituents of the blood one is treading upon uncertain ground. We know too little concerning the several forms in which these elements exist to enable us to attach much clinical significance to such immerical values. It is known that perhaps only 50 per cent of the total serum calcium, existing in diffusible form, normally takes part actively in the process of calcification. Why then include the total calcium in a determination of the Ca:P ratio in its relation to calcification? Since the ratio of diffusible to nondiffusible calcium changes during the course of pregnancy, as does the total serum calcium concentration, the calcium-phosphorus ratio early in pregnancy must be considered in an altogether different light from that late in pregnancy.

It is my opinion that studies of mineral metabolism during pregnancy should

be actively pursued inasmuch as they may shed light upon an element which, in its metabolism, undergoes profound changes during the period of parturition and lactation.

DR. KLAUDER (closing).—It is important to bear in mind that total serum calcium estimation gives only one view of a very complex mechanism. Diffusible calcium, calcium-potassium ratio, and calcium-phosphorus ratio are other phases. Again, it is likewise important to consider that estimation of serum calcium is not necessarily an index of metabolism of tissue calcium.

In our study we were searching for a clue. Had that clue been found, we would have pursued the study further.

DR. C. MAZER AND DR. I. ANDRUSSIER presented a paper entitled **The Incidence, Diagnosis and Treatment of Functional Sterility**. (For original article see page 46.)

BROOKLYN GYNECOLOGICAL SOCIETY

STATED MEETING, NOVEMBER 7, 1930

DR. GEORGE KORNFIELD read a paper entitled **The Conservative Treatment of Ablatio Placentae**. (For original article see page 101.)

DISCUSSION

DR. JOHN O. POLAK.—For years I have advocated just this plan of treatment in my service, and though we have not had as good results, having one maternal death in our series and two hysterectomies, both done for the condition that is so vividly described by Dr. Williams, we feel that our results have been encouraging.

The whole point of treatment hinges on the early diagnosis and instituting treatment before the uterus has lost its tone. Where early diagnosis is made I do not believe that these extreme cases occur with any such frequency as the teachings of DeLee or Williams lead us to infer.

We have followed practically the identical treatment outlined by Dr. Kornfeld except that we have ruptured the membranes rather more frequently and have used pituitrin repeatedly in small doses with an initial dose of morphine. We have not had as many forceps deliveries, that is to say, proportionately as are recorded in this series.

DR. CHARLES A. GORDON.—I was wondering whether perhaps it was the intent of Dr. Kornfeld to say that cesarean section should not be done at all. I do not think that was his intent. We have all seen cases where section apparently was the only way out. In the last few days we had a case in St. Catherine's Hospital where there was a rupture of the uterus as well. Certainly nothing but section would have saved that patient. Two months ago we had another patient that came into the hospital and she died in a half hour, before anything could be done for her.

It seems to me that there should be some revision of the terminology and that the term *abruptio placentae* or *ablatio placentae* should be reserved for a complete separation, the tragic type necessarily, and the term separation of the placenta used for those cases in which the separation is not complete.

DR. HENRY M. MILLS.—At the Kings County Hospital, I have been impressed with the value of blood transfusion. One patient came in at night. The resident found the cervix dilated and the patient was delivered of a small child (she was

seven months pregnant) by Braxton-Hicks, and by slow delivery the hemorrhage was controlled. The next morning the woman was in extremis, and we gave her 500 c.c. of whole blood intravenously with the result that she made an uneventful recovery. The other case was that of a woman who had been sectioned before. She was at term. She was in the ward for several days. She had bleeding at home. In the hospital she was bleeding very little. One morning, in making rounds, we found something changed in her condition; she was very pale, her pulse was almost imperceptible, and we felt, although there was no vaginal bleeding, or very little (the cervix was closed), that she was in a critical condition. I suggested section and a blood transfusion was done at the time of operation. Because of the presence of scar tissue in the abdomen and the fact that the omentum was more or less adherent to the uterus, the operation was a rather difficult one. Under local anesthesia a dead baby was extracted. In the fundus was a large amount of blood. That patient made an uneventful recovery.

DR. GEORGE KORNFELD.—I think the thing that should be emphasized is the terminology. The literature is full of all these terms. There is no definite terminology for the reason that there are so many degrees of placental separation, and, as I said before, we started with the mild, simple separation and ended with the complete separation.

The early diagnosis must be stressed.

In regard to the severe cases: it is in these cases that I think conservative treatment holds the most for us. Apropos of Dr. Gordon's remarks, I did not mean to rule out cesarean section entirely, but it is in the severe cases where there is rapid dilatation of the cervix, representing the real diagnosis of ablatio placenta, because the placenta seems to melt away, with complete separation, that rupture of the membranes and small doses of pituitrin given repeatedly, or the insertion of a bag, gives the best results. The mild cases can be left alone. In the sudden severe cases in this series nothing was done except as outlined.

DR. ONSLOW A. GORDON, JR., read a paper entitled **The Surgical Indication in Eclampsia**. (For original article see page 97.)

DISCUSSION

DR. ALFRED C. BECK.—I believe that the eclamptic patient is a poor surgical risk, and we do not like to interfere if we can avoid it. While the preeclamptic is a better surgical risk and can stand cesarean section, we do not subscribe to section as a treatment for preeclamptic toxemia. Where the patient is about to have convulsions we feel, of course, that her uterus should be emptied, but in our clinic a more conservative method is used; we usually resort to bags and as a general rule are able to deliver the patient before the onset of the convulsions. Occasionally, however, where we feel that we are dealing with a very fulminating case sometimes we will do a cesarean section, feeling that there will not be time enough between the diagnosis of preeclamptic toxemia and the actual delivery for the bag method.

We have used magnesium sulphate with good results and also bleed practically all our patients.

DR. RALPH M. BEACH.—I took the stand formerly that there were certain isolated cases of eclampsia that should be delivered by section, namely the primipara with the long undilated cervix. Today I admit that I was wrong and that now I do cesarean section very infrequently for eclampsia.

During the last three years we have had 30 cases of eclampsia in my service at the Methodist Episcopal Hospital. Of this number there have been two sections.

One case had a very markedly contracted pelvis, with a true conjugate of 8 or 8.5 and a marked funnel outlet. She came into the hospital in active labor, in eclampsia, and the indication was a double one, and section was done. The other section was in a primipara with eclampsia, and was treated conservatively. She had only two convulsions, but after thirty-six hours of labor she still was undilated. The indication for operation was cervical dystocia.

The only other argument refers to the preeclamptic state and whether these women should be sectioned. It seems a difficult matter to determine just how close a woman is to convulsions. In some cases we think they are in no danger and are surprised in a few hours to find that the patient is having convulsions. The cases we have sectioned have terminated well for both the mother and the baby.

Our routine in the eclampsia case today is to treat the woman simply for the eclampsia and wait for her to come out of the convulsive state. If she has come out of the convulsive state, is awake again, and does not go into labor by the end of two or three days, we generally induce labor.

In these three years we have done 19 sections for preeclampsia.

Latterly we have been using spinal anesthesia in practically all our cases. I think today we can probably do cesarean section for eclampsia more freely and with much better results than in the old days of general anesthesia. We analyzed the cases done under general anesthesia and our conclusions were that we made them worse; they developed postpartum pneumonia and that was one of the important contributing causes of the high mortality.

DR. JOHN O. POLAK.—I just want to offer a protest against the general use of spinal anesthesia in these cases. I think if we use local anesthesia we meet all the conditions that we have to meet. I agree entirely with Dr. Beach and with Dr. Gordon that with any general anesthetic you do exactly what you do not want to do. The ordinary CO_2 combining point is lowered, we disturb the sugar balance and these patients are bad surgical risks, not only from the standpoint of shock, but they stand trauma badly; they heal badly, many of them are edematous, and we have all the conditions which are bad for surgery. I am convinced that local anesthesia with previous morphinization meets the condition. After you have had a few deaths following the use of spinal anesthesia you do not feel so enthusiastic about it. I have had five "attacks" of spinal anesthesia. I have been very enthusiastic about it each time, and each time I have come exactly to the same end; some one has died who should not have died. When a patient starts to die under general anesthesia we can sometimes save her. With local anesthesia they do not have the same tendency to die, and I want, if possible, to avoid anything that is not foolproof, such as the death we had a little while ago from spinocain, which was one of the most interesting cases we had in a long time. The patient was in perfect physical condition and just because there was an error in bringing her in the wrong way she was tilted by coming up a little runway, an inclination of about four inches, and died immediately.

DR. CHARLES A. GORDON.—I think Dr. Gordon's best argument for cesarean section in preeclampsia is the welfare of the baby. Otherwise, I do not believe that there is a very good argument. Patients with eclampsia are notoriously poor surgical risks. Patients with preeclampsia are almost equally so. Cesarean section in eclampsia is universally condemned. At the British Congress of Obstetricians and Gynecologists in 1922, after a review of over 2,000 cases made by Eden, from Great Britain, Ireland and Scotland, the conclusion drawn was that cesarean section definitely impaired the chances of the woman for recovery. Section, I feel, has a very small place. Certainly there are mild and severe cases. Severe cases treated by mild, conservative measures, in all probability, will die. Mild cases, on the other hand, treated by severe methods will, in all probability, also die.

Schwarz and Dieckmann, noting the common association of diuresis with clinical improvement, have endeavored to bring that about, and use it as a good prognostic sign. Increased sugar tolerance of eclamptic women is probably due to chloride retention. Blood dilution with large amounts of intravenous dextrose bring about the effect produced by delivery, or death of the fetus.

Hendon's venoclysis is very promising and may prove to be even better than the admirable method of Titus. Hendon's only check on dextrose intravenously is the appearance of sugar in the urine.

Anesthesia, too, is far from settled. It is true that Stander has shown that all inhalation anesthetics produce a definite liver lesion similar to the lesion of eclampsia. Yet it is equally true that Stroganoff uses chloroform freely and repeatedly, and his results are not approached by anyone. Spinal anesthesia has great possibilities. It might well be that chloroform is bad, but the convulsions are worse.

It seems to me that some concerted effort should be made to carry out in this country the exact method of Stroganoff, just as Douglas Miller tried out the Dublin method in Scotland for five years after the Liverpool Congress.

DR. ONSLOW A. GORDON, JR.—First, I wish to emphasize that both Dr. Beck and Dr. Beach perhaps added confusion to what I expected to be a simple matter. There was no discussion concerning the advisability of section in eclampsia. I think we have all passed that stage long ago, and I did not presume to imply that we should give that point consideration. Therefore, let us consider one of the points that I tried to make, namely, the management of the preeclamptic patient. Dr. Beck suggests that in some preeclamptic patients bags and other methods of induction of labor are justifiable. I feel that that certainly is dangerous conservatism in an eclamptic or potentially eclamptic patient. Bags are uncertain in their action; they add the possibility of sepsis to these already devitalized tissues. As Dr. Beck himself suggested, a certain number of preeclamptic patients will surely develop convulsions. No one can say what group of preeclamptic patients will certainly develop convulsions and what group may get on without convulsions. It seems, therefore, best to assume, if the patient had been definitely determined to be preeclamptic, that it is not safe to continue with conservative measures after conservatism has had a certain trial in reducing the preeclamptic state or removing the patient from that state.

Dr. Beach emphasized the point which I think is very important, that these patients should have either a local or spinal anesthetic and that we have made a mistake—and now I am discussing preeclampsia—in the giving of general anesthetics in these cases.

I do not quite agree with Dr. Charles Gordon that the entire argument is for the baby in preeclampsia. I assume the opposite position, that the entire consideration is for the mother, but at the same time it greatly benefits the fetus and the patient is removed from the brink of imminent danger by the delivery of the fetus with as little traumatism and as little increase of the toxemia as possible, and that is possible by local or spinal anesthesia.

I have had no experience with sodium amytal.

BALTIMORE GYNECOLOGICAL AND OBSTETRICAL SOCIETY

STATED MEETING, OCTOBER 24, 1930

DR. GEORGE W. CORNER read a paper (by invitation) entitled **The Function of the Corpus Luteum**, of which an abstract follows:

Much of our current knowledge of the functions of the corpus luteum is based upon the work of Fraenkel, who showed that the ovary (and in particular, presumably, the corpus luteum) is responsible for successful implantation of the embryo; and also upon the studies of Aneel and Bouin, who demonstrated that the histologic changes which occur in the endometrium during the first days of pregnancy and following a fertilized ovulation are also dependent upon the presence of the corpus luteum. The recent work of the lecturer was begun by experiments designed to test and to combine the older observations. It was shown by experimentation on the rabbit that removal of the corpora lutea shortly after mating, at a time when the fertilized ova are on their way down the fallopian tube, prevents the progestational changes in the endometrium and thus leads to a failure of nourishment of the embryos when they reach the uterus, so that they are not implanted. Using such animals castrated on the first day of gestation, it has been possible to prepare extracts of the pig's corpora lutea which produce progestational alteration of the endometrium and thus enable the embryos of the castrated mother to survive in the uterus, to become implanted and even (if administration of the extracts be continued) to go on to birth at full term. Although the extracts have not been fully purified, it is obvious that the corpora lutea of the pig contain a substance (named "progestin" by the lecturer and his fellow-worker, W. M. Allen) which has the property of favoring gestation by acting upon the uterus so as to maintain the embryos. The well-known active substance of the graafian follicle and human placenta, first isolated by E. Allen and Doisy and known under various names, such as oestrin, folliculin, "the female sex hormone," etc., does not possess the power of producing progestational proliferation of the endometrium, but as predicted by Novak (and as demonstrated by Hisaw with regard to the relaxative hormone), the uterus must be under the influence of oestrin before it can respond to progestin. Extracts containing progestin have been shown by Weichert and by Goldstein and Tatelbaum to sensitize the uterus of the nonpregnant animal so that it responds to mechanical stimulus by the production of deciduomata similar to those produced in the well-known experiment of Loeb.

The chemistry of progestin is not yet understood. It is soluble in all lipid solvents, withstands fairly high temperatures and is not easily oxidized, but is very sensitive to alkalis.

Hisaw and his fellow-workers at the University of Wisconsin have isolated from the pig's corpus luteum another hormone named by them "relaxin," which has the power of producing relaxation of the symphysis pubis of the guinea pig similar to that normally occurring in this species during pregnancy.

In addition to these two effects there is a third reaction of the reproductive tract which may be ascribed to the corpus luteum, namely, mucification of the vaginal epithelium in rodents. The exact relation of this effect to the action of progestin and relaxin is not yet understood.

It has often been supposed that the corpus luteum acts to inhibit ovulation, but in the opinion of the lecturer this assumption remains unproved. Although numerous extracts have been described which possess the property of inhibiting the estrous

cycle of small rodents as tested by the vaginal smear method, these extracts have been made by such diverse methods that it seems possible that the effect in question is not specific.

The relation of the corpus luteum to growth of the mammary gland during pregnancy and to lactation remains to a large extent obscure. Slight changes of the mammary gland during the normal cycle and in the earlier weeks of pregnancy have been ascribed plausibly to action of the corpus luteum, but up to the present no one has demonstrated marked changes such as occur during pregnancy as a result of the administration of corpus luteum extracts. In Corner's hands highly potent preparations of progesterin administered to nonpregnant animals have failed to alter the mammary glands. On the other hand, extreme growth of the mammary glands and lactation may be produced without difficulty in castrated rabbits by the injection of alkaline extracts of the anterior lobe of the hypophysis. It remains to be seen in what way the reproductive tract and the hypophysis are linked in the chain of events which leads to lactation.

The relation of the corpus luteum to menstruation, though not yet clear, will no doubt be worked out by an application of these new advances in ovarian endocrinology. Working with monkeys, Hisaw, Meyer, and Fevold have already shown that extracts containing progesterin produce the so-called premenstrual changes of the endometrium. Their observations have been confirmed in unpublished experiments of the lecturer. It has already been known for some years as a result of the work of Corner, E. Allen, and Hartman that in monkeys menstruation frequently occurs without ovulation. In these cases the menstruating endometrium shows nothing of the so-called premenstrual change. As far as we can understand the matter at present, it seems probable therefore that the periodic recurrence of bleeding from the endometrium is not controlled directly by the corpus luteum. The function of the corpus luteum in the menstrual cycle is simply to produce the so-called premenstrual changes which are in normal cycles followed by bleeding.

In summary, the corpus luteum has been shown up to the present to produce two hormones, namely, the relaxin of Hisaw and his colleagues and the progesterin of Corner and W. M. Allen. The action of these hormones is to produce certain changes in the reproductive tract which, in the first place, facilitate the nutrition and implantation of early embryos, and, in the second place, relax (in the guinea pig) the symphysis pubis, to facilitate parturition. In each case these effects are brought about as a result of the successive action of oestrin and the corpus luteum hormone.

ABSTRACT OF DISCUSSION

DR. CARL HARTMAN.—This presentation of the corpus luteum problem leaves one with diminished respect for biologic theory. Take, for example, the breast hormone. The cause of the gestational hypertrophy of the mammary glands has been generally taken to be the corpus luteum and in this conclusion morphology had the support of physiologic experiment. Thus the opossum was seen to have a tremendous and rapid growth of the mammary glands both in pregnancy and in pseudopregnancy with corpora lutea in the ovaries. Further, if a bitch lactates seventy days after ovulation in the absence of pregnancy one is certain to find fairly well-preserved corpora lutea present. Now, however, we find that the Corner-Allen luteal hormone, effective by the endometrial and the maintenance-of-pregnancy tests, has no effect on the growth of the mammae, while anterior lobe extract, even in the absence of the ovaries, is entirely effective in causing complete pregnancy hypertrophy of the mammary alveoli. Perhaps it may be found that lactation itself, i.e., actual secretion of milk, is under the same influence, for it certainly is not under the influence of the corpora lutea since these are often not present at

all during lactation. It is known, indeed, that cyclic changes in the ovaries inhibit milk secretion; hence the practice of veterinarians of spaying cows to make continuous milkers.

Another "accepted" function of the corpus luteum the speaker asks us to give up is that of inhibiting growth of the follicles and ovulation. This is not, we are told, specific for the corpus luteum, for other extracts have the same effect. I have myself long noticed that both in the monkey, at one end of the mammalian series, and in the opossum, our lowliest American mammal, lactation is quite sufficient, for long periods, to inhibit the ripening of follicles, though there be no signs of corpora lutea present in the more or less infantile ovaries.

Recently, too, we have had to strike from the list of luteal effects the decidual reaction of L. Loeb. This function, experimentally, has also been transferred to the anterior lobe.

The corpus luteum has likewise been removed from the center of the stage in the menstruation problem. It is to the credit of the gynecologist that the sequence of events in the menstrual cycle of women has been worked out and that on this basis the corpus luteum was eliminated as the active cause of menstruation. However, the substitute theory that menstruation was caused by the death of the egg and the degeneration of the corpus luteum was even worse and more sterile for real progress in the elucidation of the menstrual physiology. Dr. Corner first showed that periodic uterine bleeding may go on without ovulation; hence without corpora lutea. We have in the Carnegie monkey colony gone a step further and followed his example by locating, as we think we have done, the origin of uterine bleeding in the anterior lobe. What a worshipful gland the hypophysis, once the seat of the soul, is getting to be!

DR. EMIL NOVAK.—The demonstration, by Dr. Corner and Dr. Allen, of the active principle of the corpus luteum is a contribution of first importance to our knowledge of the physiology of the human cycle, filling out a gap which many of us have long felt must exist. It deals a final blow to the concept of a single "female sex hormone." Whether progesterin will prove of value therapeutically it is too early to say, though it is rational to expect that it will. The most valuable indication for its use, it seems to me, will be in the treatment of functional hemorrhages, in which there is characteristically an absence of corpora lutea in the ovaries, and, presumably of progesterin in the circulation. It may be of value also in the management of those cases of amenorrhea in which treatment is indicated. Unfortunately, its effect, like that of the follicle hormone, is purely a substitutional one, so that this method of treatment may still be unsatisfactory. There is more reason to expect good results from treatment with anterior pituitary principles, when these are made available, for these may be expected to exert a genuinely activating influence upon ovarian function.

DR. A. C. TIEMEYER read a paper entitled **Placenta Accreta**. (For original article see page 106.)

ABSTRACT OF DISCUSSION

DR. J. WHITRIDGE WILLIAMS.—Dr. Tiemeyer's case represents the only one of the kind which I have had an opportunity to study. So far as I recollect, I have only made such a diagnosis in one patient, who refused operative interference and I do not know what became of her.

The only criticism I can make in reference to the case is the statement that the condition is due to the defective formation of decidua, which in this instance was attributed to the course of her previous labors. Naturally, this offers the simplest explanation for the abnormality, but I am not sure whether it is always correct

My reason for this statement is that in my histologic studies of pregnant uteri with the placenta in situ, I have found the greatest possible variation in the behavior of the decidua basalis; and in the same uterus areas may be found with a relatively thick decidua, while in others it is almost entirely absent. In such areas all trace of a spongy layer has disappeared.

DR. I. A. SIEGEL presented a paper entitled **Placenta Previa**. (For original article see page 110.)

ABSTRACT OF DISCUSSION

DR. LOUIS H. DOUGLASS.—There are several points which I feel should be emphasized more strongly:

First.—The ease of making a diagnosis of placenta previa and the importance of an early diagnosis. These cases must be seen and treated early, but it would seem as if there were something wrong with our teaching of the subject in this connection. The pregnant woman fears hemorrhage and will almost invariably notify her doctor as soon as she starts to bleed, no matter how slight the amount may be. In spite of this, patients are brought into the hospital after they have bled two, three, or four times and when admitted are in extremis. These cases have been seen by their doctors who know they have been bleeding and yet delay in recommending admission to a hospital.

Second.—The incidence of placenta previa among the white and colored patients. Among the 115 cases, 77 were white and 38 colored, which is an incidence of 2 to 1, but when we remember that our clinic is about 80 per cent colored this gives us an actual incidence of 8 to 1. If we accept the usual etiologic factors, we should find them much more prevalent in the colored than in the white. I have no explanation to offer for this and am merely presenting it, hoping that some one will be able to explain.

DR. J. M. H. ROWLAND.—I am very enthusiastic about cesarean section in all cases of placenta previa, except for the marginal variety. Under certain circumstances, even these, i.e., cases with undilated cervixes and women not in labor with considerable bleeding, should be subjected to section.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO, ILL.

AN ANALYSIS OF OBSTETRIC WORK DONE IN ESSEX COUNTY, N. J., HOSPITALS FOR THE YEARS 1927-28-29

BY CARL H. ILL, M.D., NEWARK, N. J.

THE Maternal Welfare Commission of the Essex County Medical Society was organized in May, 1923. It was organized by the Essex County Medical Society to try to better the obstetric mortality and morbidity of this section. One of the

FIG. 1.—STANDARD OBSTETRICAL RECORD

Name		Date Admission	
Case No.	Boy	Girl	Date Birth
Race	Alive	Stillbirth	Abnormality
Remarks:			
Position		Toxemia	Prematurity
Forceps		Eclampsia	Laceration
Caesarean		Placenta Previa	Sutures
Version		Hemorrhage	Infection
Remarks:			
Condition of mother on discharge			
Condition of child on discharge			
Date		<i>Signed</i>	

TABLE I. TOTAL NUMBER OF CASES IN ALL NEWARK HOSPITALS FOR THREE YEARS

	1927	1928	1929
Total number of cases	6257	6307	8621
Alive	5965	6099	8224
Stillbirths	205	219	310
Twins	31	51	58
Head presentation	5817	5921	7191
Breech	212	246	217
Forceps	602	588	1173
Version	72	56	100
Toxemia	71	52	106
Eclampsia	25	35	32
Placenta previa	52	47	40
Hemorrhage	93	66	115
Infection	74	40	35
Laceration	1339	1416	2330
Cesarean sections	124	106	167
Baby deaths	10	11	7
Mothers deaths	11	8	11
Baby deaths	168	183	196
Mothers deaths	36	34	44

TABLE II

HOSPITALS	A	B	C	D	E	F	G	H	I	J	K	L	M	TOTAL
TOTAL NO. CASES	1618	465	3187	1569	1472	2386	975	530	363	4290	1137	2604	589	21,185
Stillbirths	258 42	378 14	31 102	205 33	381 62	388 95	297 29	377 20	0.3 14	479 205	237 27	317 83	1.35 8	34 734
Twins	996 16	00043 2	0.80 26	0.96 15	0.57 10	1.03 27	0.41 4	0.37 2	0.2 7	0.301 14	0.96 11	0.60 22	1.35 8	0.6 140
Breech	407 66	372 16	3.79 118	2.88 45	2.63 38	3.14 80	2.23 22	2.24 12	0.45 15	2.88 118	3.36 38	3.93 103	0.67 4	3.2 675
Forceps	507 55	477 18	28.5 914	1.4 216	10.7 172	1.92 530	7.47 73	9.95 53	0.4 15	1.23 53	9.41 73	4.49 117	8.65 51	10.9 2363
Version	0.39 6	4.61 20	0.91 20	0.43 12	0.89 15	1.81 43	1.02 10	0.55 3	0.1 7	1.606 68	1.06 12	0.45 12	0 0	1.0 228
Toxemia	0.46 8	0.0021 1	1.24 40	0.83 8	0.93 19	1.25 28	0.10 1	1.85 10	0 0	1.664 73	2.84 32	0.35 9	0 0	1.0 229
Eclampsia	0.86 6	0.0021 1	0.41 13	0.59 9	0.11 3	0.16 24	0.10 1	0.18 1	0 0	0.525 23	0.44 5	0.23 6	0 0	0.4 92
Placenta previa	0.31 5	2.53 14	0.39 13	0.13 2	1.10 9	1.55 32	0.60 6	0.37 2	0.05 2	0.898 38	0.434 5	0.27 7	0.67 4	0.63 139
Hemorrhage	0.81 13	0.89 2	0.03 1	0.85 15	0.15 4	0.74 14	12.12 119	0.37 2	0.1 5	0.082 3	0.875 10	3.14 83	0.51 3	1.2 274
Infection	0.21 3	0.0021 1	0.09 4	0.85 15	0.20 3	0.565 10	0.20 2	1.32 7	0.1 4	0.470 20	5.12 58	0.85 22	0 0	0.7 149
Cesarean section	1.49 24	0.92 2	1.72 56	5.65 87	4.99 81	1.15 28	9.2 9	2.24 12	0.1 4	0.939 39	3.32 40	0.57 15	0 0	1.8 397
Baby deaths	25 6	0 0	1.8 1	2.3 2	9.9 8	14.0 4	0 0	0 0	0 0	7.7 3	7.5 3	6.6 1		7.23 28
Mothers deaths	4.1 1	0 0	5.36 3	9.2 8	6.1 5	18.0 5	0 0	0 0	0 0	15.5 6	5.0 2	0 0	0 0	7.6 30
Baby deaths	1.46 24	2.35 7	2.96 94	1.80 30	2.30 26	1.023 33	3.87 38	0.55 3	0.1 6	4.90 208	2.54 29	1.88 49	0 0	2.7 572
Mothers deaths	0.18 3	0.0021 1	0.46 15	0.52 8	0.55 8	0.29 8	0.31 3	1.29 7	0.08 3	1.29 54	0.352 4	0.18 5		0.5 119

functions was a survey of all the hospitals doing obstetrics in the county and analysing their reports. In order to get uniform records a standard chart was developed and has now been adopted by all the hospitals (Fig. 1). These records are very simple and were purposely kept so, because we realized that by going into too great detail we would not have nearly as accurate data. Before this work was undertaken hardly any of the hospitals had any idea of what work they were doing and rarely summarized their work for the year.

Each hospital fills out a card for each delivery (Fig. 1), which contains all the information that we use for the annual report from the institution and all that the historian has to do is total the cases and send them in to the Committee. Each year we have less and less trouble getting the report, and although these figures are not entirely complete we feel we have enough to make it worth while to publish them. It must be remembered that in Essex County there are no teaching institutions and by far the greater amount of obstetrics is done by general practitioners.

Table I shows the total work done for the three years. The total for the year 1929 is larger because for the first time we have the entire number of cases of all but one hospital which has failed to cooperate with us.

TABLE III. INDICATIONS FOR CESAREAN SECTION IN 397 CASES

Disproportion (pelvis and head)	141
Former cesarean section	23
Toxemia	11
Eclampsia	14
Unprogressive labor	34
Premature separation of placenta	6
Placenta previa	19
Breech	9
Heart disease	9
Ruptured uterus	4
Hypertension	5
Fibroids obstructing labor	3
Face presentation	3
Cardiac disease with pulmonary tuberculosis	1
Stenosis of cervix	1
Neurosis, a former complete repair	1
High amputation cervix, left phlebitis	1
Atresia	3
Hypertension, former prolonged labor with stillbirth	1
Transverso position, former stillbirth	1
Malposition of fetus	2
Ankylosis of hip	1
Previous difficult labor, severe laceration	1
Glycosuria	1
Laceration of vagina and broad ligament	1
Difficult labor, in 11 out of 13 pregnancies	1
Uterine sepsis	1
Aged primipara, prolonged labor	1
Premature ruptured membranes	1
Not given	97

Table II shows the work done in the individual hospitals for the three year period. I tried to get a differentiation between Ward and Private cases, but as several hospitals included their semiprivate with their ward cases I could not use these figures. As a whole, however, the more ward work done the better the statistics of the hospital.

The number of breech cases was fairly constant in the different hospitals; ranging from 4.07 to 0.67 per cent, with an average of 3.2 per cent.

The use of forceps varied very greatly from 28.5 per cent to 0.4 per cent with

a general average of 10.9 per cent. These of course, included all the low forceps cases, which everywhere constituted the largest number.

Versions also were quite evenly divided; ranging from 4.61 per cent to 0 per cent, with an average of 1.90.

Toxemias were likewise evenly distributed. Although every hospital seemed to have a different conception of just what to report as a toxemia. Some reported every rise in blood pressure over 160, others only those with definite toxic symptoms but no convulsions. We are endeavoring to standardize this.

TABLE IV. CESAREAN DEATHS

Sepsis	11
Placenta previa	1
Ruptured uterus	1
Pulmonary embolism	1
Cerebral embolism	1
Shock	3
Eclampsia	4
Toxemia	2
Cardiac insufficiency	3
Fractured vertebrae	1
General sarcomatosis	1
To save baby	1

Eclampsia ran very even through all the hospitals with a high percentage of 1.25 per cent to 0 per cent, and an average of 0.4 per cent. The same applies to placenta previa.

Cesarean section shows the most interesting differences. The number was 397, or 1.8 per cent of all cases and varied from 0.190 to 5.65 per cent in the various hospitals. The babies that died following cesarean were 28, or 7.23 per cent. This ranged

TABLE V. CAUSES OF MATERNAL DEATHS, 41¹

Toxemia	4
Eclampsia	4
Shock and inverted uterus	1
Pneumonia	5
Pernicious anemia	1
Pyelitis, phlebitis, double pneumonia	1
Hepatic toxemia with terminal bronchial pneumonia	1
Acute dilatation of heart	2
Tuberculosis with heart complications	1
Streptococcus blood stream infection	1
Pleurisy, heart failure	1
Cardiac, toxic	1
Shock, difficult delivery, toxic	1
Fulmination, pulmonary tuberculosis	1
Nephritis, eclampsia	1
Postpartum hemorrhage	2
Phlegmonous gastritis	1
Pulmonary embolism	1
Puerperal sepsis	2
General peritonitis	2
Uterine bleeding, anemia	1
Shock, hemorrhage	1
Embolus	1
Meningitis	1
Carbuncle on lip, streptococcus infection	1
Eclampsia, edema of lungs	1
Bronchial pneumonia	1

¹This list does not include deaths from cesarean section which occurred in the Newark City Hospital.

from 25 per cent to 0 per cent. Thirty mothers died, 7.6 per cent, ranging from 18 per cent to 0 per cent.

During these three years 572, or 2.7 per cent babies died before they left the hospital. This included all the prematures, and as there were 734 stillbirths this gives a grand total of 1306; about 6 per cent of all mothers entering the hospitals went home without their babies. The baby deaths ranged from 4.90 per cent to 0.10 per cent.

The maternal deaths were 119 or 0.5 per cent, the highest rate being 1.29 per cent; the lowest 0.0021 per cent.

The indications for cesarean section are given in Table III. By far the larger part are classified under disproportion. This included all flat pelves, small pelves and large babies in a rather small pelvis. There were 14 cases in which cesarean was done for eclampsia, with four deaths, or 2.8 per cent, which is rather high. There were 80 cases of eclampsia treated without operation with 11 deaths or 1.3 per cent. There were 19 patients with placenta previa operated upon with 1 death or 5.2 per cent, against 6 deaths out of 139 nonoperated cases or 4.3 per cent. There were 11 toxemia cases sectioned with 2 deaths or 18.2 per cent, against 2 deaths in 229 cases conservatively treated or slightly less than 1 per cent.

Table V shows the maternal deaths in this series. If we omit the 30 cesarean deaths we have 89 cases left. Eighteen died from some cause not related to the pregnancy, which leaves 71 deaths due to some accident of pregnancy. This corrected mortality, leaving out the cesarean sections, gives 63 deaths out of 20,788 cases not sectioned, or a rate of 0.3 per cent.

In analyzing again the total of 119 deaths, we find 25 due to causes which are nonobstetric. This gives a corrected mortality of 0.4 per cent.

Another very interesting fact is that if we leave out the Newark City Hospital deaths, where most of the neglected cases are sent, we have 65 deaths in all the other hospitals; of which 24 were due to cesarean sections, or almost 40 per cent.

188 CLINTON AVENUE.

Correspondence

THE ABORTION PROBLEM IN RUSSIA

To the Editor.—A two weeks' visit to Russia last summer gave me an opportunity of studying at first hand the revolutionary doctrines concerning legalized abortion about which I had been reading for some years. Russian medical literature has been filled with reports from innumerable clinics giving figures and more figures. What I wanted to know was how the thing actually worked. I shall therefore refer only very briefly in this article to the statistical side as presented by the government officials and rather stress the things that I saw and heard and, as nearly as I can depict them, the conditions under which they occurred.

I prepared myself for the trip by obtaining several letters of introduction to government health officials, and by a conference, secured through the kindness of Dr. R. L. Dickinson, with Dr. Cheftel, the New York representative of the Russian Department of Health. The numerous changes that were just at that time being made in the personnel of the department, presented certain difficulties. While it was necessary often to do some waiting around, no obstacles were placed in my way and I could see whatever I asked for.

My itinerary was as follows: Entering Russia from Finland July 12, 1930, I spent four days in Leningrad, then went to Moscow for eight days and finally spent a little over a day in Kiev before leaving via Poland and Rumania for Constantinople. I found my knowledge of German very valuable and most of my conversations were carried out in that language, although occasionally I had recourse to a Russian interpreter.

The first twenty-four hours in Leningrad made me realize that Russia was still in the throes of a revolution. The delapidated, unpainted buildings in the Nevsky Prospect, the dirty, ill-smelling marble stairway of the Hotel de l'Europe, the up-turned paving everywhere in the streets, the endless lines of people, waiting, waiting for their turn in the food lines; men and women swarming along the streets or hanging at a dangerous angle from the platform of the crowded street cars; all made you realize that the thirteen years that had elapsed under Soviet rule had not sufficed to put the socialist doctrines on an organized efficient basis. My visit to the von Ott Maternity, at one time considered the finest in Europe, was particularly enlightening in this regard. I had made an appointment with charming old Professor S—, for many years its director, who has an apartment on the top floor of the building for the resident staff. He is consultant in eclampsia, but otherwise has no longer any official position in the maternity. Apparently he had never received the letter I had written him from America. After a short conversation in his rooms on the subject of eclampsia, I asked to see the Maternity. He told me that it was completely shut down for two months for repairs and all patients were being handled in other institutions. As a matter of fact the repairs were minor ones, such as painting and a little plastering and carpenter work. Dr. S— graciously led the way across the court to the maternity entrance where stood a Soviet guard. He explained that he wished to show the building to a foreign visitor and we were permitted to enter. To the left of the corridor was the office and as we entered, two women were seen sitting at desks working over some papers. As the professor approached and asked a question, neither showed him the slightest respect or interest but nodded toward the door of the next room where the janitor and two men were seated about a table doing nothing. I surmise that Professor S— was asking

for some one to open the doors of the various rooms so that he might show me the building. For a few moments the professor's voice was raised in irritation when his request was refused. He returned to the office and opened the door of a little closet in which hung 40 or 50 keys. None were labeled or numbered, so after picking up one or two for signs of identification, he shrugged his shoulders and turned apologetically to me, saying that he would not be able to show me as much as he would like. Then followed a parade through corridors past barred doors with here and there a workman or two spraying plaster on the walls. To relieve his embarrassment, I pleaded another appointment and made my departure, thanking him for his courtesy.

In Leningrad after a conference with some of the officials of the local Narkomsdrav (Health Department), I visited the Institute for Mother and Child. From the health officials I learned that physicians have an income of from 150 to 500 rubles a month (\$75 to \$250) for their government work which takes usually about four hours a day. At other times they may have private patients but a graduated government income tax starting at 10 per cent on 1000 rubles, 25 per cent for 2500 rubles, etc., is a damper to any enthusiasm to build up a practice. The Institute for Mother and Child was a collection of old buildings of none too prepossessing appearance with a capacity of 720 beds, of which 220 were for the unmarried or deserted mothers. These outcasts were well cared for and for the year after the birth of their children, while they were nursing, they were sheltered and taught some way of making a livelihood. Whenever the name of the father was given, he was compelled to pay one-third of his income for the support of the child. Special courses for the training of physicians and nurses were given at this Institute, and according to the officials in charge, the sum of 75,000 rubles was appropriated for research work there. The milk preparation station, a two-story, well-equipped building, was in contrast to the shabbiness of the remainder of the Institute. There were no screens and the flies buzzed in numbers around the cribs of the premature children, who seemed to be surviving in spite of them.

Moscow was much cleaner and better organized than Leningrad. Shortly after my arrival I had conferences with Dr. Ettinger, Assistant Commissioner of Health and with Dr. A. B. Genss, who is the official statistician and has effectively organized the investigations concerning abortion and contraception. The overy-fifth-day holiday system, together with the usual delays of Russian officialdom, made it somewhat complicated to meet the various persons I wished to see. In a long talk with Dr. Genss and Dr. Ettinger I obtained much information on the Russian situation. It was, however, very difficult to learn how much of this were plans on paper and how much was actually in operation. There are four general courses of instruction in the medical schools: (1) general medicine, duration four and one-half years; (2) sanitary prophylaxis (public health, sanitation, infectious diseases), duration four years; (3) maternal and infant welfare (obstetrics, gynecology, and pediatrics), duration three and one-half to four years; (4) dentistry, duration three to three and one-half years. During the summer months the student serves as assistant to some doctor in the country districts. To get a university position, requires three years' hospital training for an assistant, seven years for an instructor, and special ability and research work to become professor. The children of workers are given preference to all others as students and a special three years' premedical course arranged for them. Of interest was the fact that at present about 50 per cent of the medical students are women. New schools are being established rapidly. Three new ones were begun in 1930 (one in Nijni-Novgorod and two in Siberia). Ninety per cent of the students pay nothing for education, get a room and a small stipend from the state.

Dr. Genss dwelt on the intensive work in investigating various methods for preventing conception. Every suggestion was given a trial, even those recommended by

charlatans. A small soft rubber ball filled with a gas, which expanded when the ball was placed in the vagina and so shut off the upper vagina, was being used in some cases. The Kafki metal pessary was found especially useful in cases of anteversion. The Mensinga type pessary was used in cases of first degree retroversion and in cases of complete retroversion no pessary but contraceptive pastes were alone employed. Numerous birth control clinics were established all over Russia but the cost of contraceptive measures made it impossible for the masses to employ them with any degree of completeness, and hence it was felt that for a considerable period of time abortion would have to be employed to limit the size of families.

Similarly, various methods for inducing abortion beside the usual curettage, were given a trial. The paste employed with reputed success, as intrauterine injection and devised by a German druggist named Heiser, had been used in 55 cases. The injection of 5 per cent tincture of iodine in the uterus was done in one series. At regular intervals a conference is held by the group of physicians in charge of these abortion clinics and the results of treatment discussed and recommendations made. Thus the conference had voted against the temporary sterilization with x-ray and the use of 5 per cent iodine and had decided that surgical sterilization, unless done in association with other operative procedures, should only be performed after a consultation by 3 physicians. It should be limited to mothers, over the age of thirty-five years, who had 3 or more children.

The astounding reports on the absence of mortality after abortions were of course well known to me and I was glad to get a chance to question Dr. Genss more closely on this subject. He stated that no deaths could be directly attributed to 201,480 abortions, done in the Moscow district in 1927, but with this "alibi": Two women had died, one from a gonococcus infection that had been overlooked at the time of the abortion, and the other from a streptococcus infection communicated through the sperma of the husband, for such streptococci were later found in the husband's sperma. I leave it for the reader to draw his own inferences, as to whether a zero per cent mortality is justified under such circumstances.

I was most anxious of course to see things at first hand and so looked forward to the next day when I was to visit one of the large abortaria in the Arbat district of Moscow. There were two of these in Moscow, each with a capacity of about 250 beds and devoted solely to the handling of the induced abortion cases. The diagnosis and operative indications were made in dispensary rooms on the first floor. No Aschheim-Zondek tests were ever employed. Cases were selected with some care and while the general understanding was that any woman who desired an abortion could have it done, three groups of cases were eliminated or reduced to a minimum: (1) primiparae, who could give no valid reason why they should not have at least one child, (2) women, who had passed the third month of gestation and were therefore more apt to get hemorrhage or a perforation, (3) women, who gave evidence of an active cervical infection. In the last named group an attempt to cure the infection was made and, if successful, abortion was done later. In the more advanced pregnancies medical indications were usually required to justify induction of abortion. The physician or anyone else, who accepts pay for the abortion, is of course punished by imprisonment. In the first years the state made no charge for such abortions but in order to secure hospital facilities and equipment to take care of the thousands who asked for interference, it became necessary to distinguish between those who could pay something and those who were penniless. The abortion commission that formerly was concerned to some degree with indications, now confines its work to determining whether the patient's economic conditions justifies a free operation. Only 20 to 30 per cent of the cases are free. The remainder must pay a fixed fee calculated on 25 per cent of the joint average income of the family. Thus if the husband earns 150 rubles a month and the wife earns

50 rubles a month and there are 3 children, the charge for the abortion would be 25 per cent of 200 divided by five, or 10 rubles, the equivalent of five dollars.

The Moscow Abortarium was a rather dingy 3-storied building, one division of which was devoted to the free cases and the other to the pay cases. Each division had its own operating room, the better one being for the free cases. In this room, approximately 15 by 20 feet, were two ordinary treatment tables. I arrived at 11:30 in the morning accompanied by 4 other American physicians who were visiting in Moscow at the time. We were greeted by Dr. Moschudinski who was expecting us. The morning's work had already begun. In the free operating room two patients were being curetted, one by a man and the other by a woman physician. The patient lay in the lithotomy position clothed merely in a hospital jacket and without any special drapes. On the table to one side lay the instruments, spread out on a sterile tray, consisting of a Sims speculum, two tenaculum forceps, a set of graduated Hegar dilators, two large open curettes, one sharp and one dull, the loop measuring 3 cm. long and 1.2 cm. wide, a dressing forceps, and a wooden stick applicator covered with alcohol-soaked cotton. A small number of gauze sponges were available but not often used. A single pair of rubber gloves was divided between the operator and his nurse assistant, in each case the ungloved hand being kept as far as possible from direct contact with the instruments used in curetting.

When we entered the room, both operations were in progress and blood was flowing freely, though without unusual hemorrhage, as with long sweeps the curette brought away pieces of placenta and ovisac. There was scarcely a groan from either of the patients throughout the procedure and with a surprising speed it was completed and the patient lifted on a stretcher and taken away to make room for the next one. After watching about 6 operations here, we proceeded to the private operating room where we stayed a longer time. Dr. Moschudinski did none of the operations himself, but stood ready to answer any questions and show us what we wanted to see. He said that patients were admitted the evening before at 5:00 P.M. when the urine was tested and the cervix examined for evidence of gonorrhea. The patient was given a bath and enema, and the vulva shaved. The following morning without any preliminary medication of any sort and without any anesthesia, the patient got up on the operating table, was placed in position and the external genitals scrubbed with tincture of soap for one to two minutes, followed by a lysoform vaginal douche. Then sterile stockings were slipped on. The operator and nurse were in the meanwhile scrubbing their hands for about three minutes. No gowns or sterile dressings were employed, only a towel slipped under the hips just before beginning the operation. A Sims speculum was then introduced and the cervix caught with a tenaculum forceps. The nurse held these instruments, while the operator wiped out the vagina with lysoform or bichloride solution and then took the wooden applicator soaked in alcohol to clean the cervix. Dilatation of the cervix with graduated Hegar instruments was begun, the gloved finger being in each case held at a point on the dilator to prevent perforation of the uterus. Dilatation proceeded until the large Recamier curette could be introduced and curettement begun, first for several minutes with the blunt curette and then for a shorter time with the sharper one. As a rule the operator before beginning assured himself of the exact size of the uterus by a bimanual examination. All of the women whom we saw operated upon that morning were multiparae, although Dr. Moschudinski told us that one of the women operated upon before our arrival had not before been pregnant.

As to anesthesia, we were told that both to diminish the risk of bleeding and because of the expense, it was employed in less than 1 per cent of the cases. Since only about 5 per cent of the women aborted were primiparae, necessity for narcosis was reduced. Nevertheless there was ample evidence of severe suffering by many of the women in the process of dilating the cervix and their groans sent shivers

down our backs. However, the ability of the Slavic people patiently to endure pain was amply shown by the way these women would cheerfully respond to Dr. Maschudinski's question and say that it wasn't so bad. Some few even smiled as they slid over from the table onto the stretcher and were taken away.

The morning that we visited the abortarium of Dr. Moschudinski there were done 57 abortions, of which number 20 were done in the free clinic and 37 were done in the pay clinic. The operative work began at 10:30 A.M. and was finished by 1 P.M. We actually saw during the time of our stay between 20 and 25 of these abortions. The speed with which this work is done can best be seen when we figure that in the one hundred and fifty minutes operating time with four tables being used (two in each room), it would allow for the 57 operations that morning, a trifle over ten minutes for each procedure. These ten minutes were consumed as one minute getting on and off the table, three minutes preparation, and six minutes of actual curettement. That a considerable amount of skill and clockwork efficiency was demonstrated cannot be gainsaid.

Even more interesting was our subsequent visit to the postabortion wards. Every bed was taken in these overcrowded rooms (14 beds to a room that should hold only 7 or 8 at the most). The only empty ward was the one that had been occupied by the patients leaving that day, the bedding of which was being aired for those who were to enter that evening. Stolid indifference characterized the faces of most of the women, although to please Dr. Moschudinski, some of them would laugh and say they felt fine. Only an occasional face showed a pallor indicative of a severer blood loss and none seemed to have fever. I asked to see the patients' charts and looked over 30 to 40 of them without finding more than 3 elevations of temperature up to 38° C., all of them subsiding with the passage of clots and tissue in twenty-four hours. In the septic room containing 3 beds there was but one patient. Her highest temperature was 38.5° C., and she did not seem to be very sick. This abortarium was one of the few hospitals I saw in Russia with screened windows. The patients were allowed to sit up on the second day, walk on the third day, and leave the hospital on the fourth day after operation. The total stay in the hospital in Moscow, therefore, was five days. In less well-equipped cities such as Kiev the stay had to be limited to three days owing to the small number of available beds.

Dr. Moschudinski then showed us a small laboratory where urine tests were made. He told us that out of about 20,000 abortions done in the past year at his abortarium there were two cases of extrauterine pregnancy and only 3 or 4 perforations. All of the patients had been operated upon by Dr. Moschudinski without a death. They did not permit induction of abortion after the third month except in very rare instances and consider that at six to eight weeks the operation is less complicated than during the first month. The total number of legalized abortions in Moscow can be figured as 40,000 annually, or 20,000 for each abortarium. This corresponded exactly with the record of our day's visit: $57 \times 360 \text{ days} = 20,520$.

An interesting side light on the abortion question was obtained by my visit to Kiev, where I had a very satisfactory conference one evening with Professor Wittenberg. At his home, where he most courteously received me and my family, he told me of his work with a frank sincerity that was quite convincing. He said that he, like most of his colleagues, had at first been very skeptical of legalized abortion, but that the experiences, especially of the last few years, convinced him that, at least for Russia, it was the lesser of two evils and should be continued. In Kiev there were in 1929 over 8,000 abortions, in 1930 about 10,000. Many women from neighboring villages came to Kiev to have the abortion done under better hospital conditions. Compared with fifteen years ago when abortions were done secretly by midwives and charlatans, there was a marked drop in the number of febrile abortions. In his service at the university, Professor Wittenberg had 15 beds in gynecology, 15 beds in obstetrics, and 25 beds for abortion cases. Out of the

5,000 abortions done in two and one-half years in his service there were no deaths, one perforation with intestinal injury requiring operation, and two other perforations not requiring operation. Owing to limited bed capacity patients were admitted in the morning and operated upon the same day, remaining only forty-eight to seventy-two hours after operation. In place of narcosis psychotherapy was often attempted by telling the patient that a given local application would relieve the pain. Expense of cocaine and anesthetics made this necessary. In Professor Wittenberg's clinic the charges for abortion were as in Moscow, but there was only one free bed out of the twenty-five. The total abortion beds in Kiev were 75.

The operative technic in Kiev was as follows: Shave, scrub with soap, give 1-4000 formalin vaginal douche, apply tincture of iodine to cervix, dilate to No. 10 for two months' gestation and to No. 14 for three months' gestation, curette with large, sharp Recamier curette and use a soft placental forceps like our sponge holders to clean out the cavity. This was followed by an intrauterine irrigation of 1-4000 formalin solution with a Bozeman irrigator. Up to last year a cervicovaginal tampon was used but recently only in cases of severe bleeding, and not longer than six or eight hours.

I asked Professor Wittenberg about readmissions for incomplete procedures. He stated that there had been about 25 such cases in the past year and that less than 1 per cent ran a febrile course. In my interview with Professor Braude of Moscow I also heard something of these readmissions after curettage. Professor Braude, a former assistant of Professor Strassman of Berlin, is editor of the leading journal on obstetrics and gynecology in Russia and head of the second Moscow University Clinic. He sees nothing of legalized abortions now and was hence unwilling to talk freely. He did not deny, however, that a certain percentage of abortions developed complications after they left the abortarium, and that readmissions for infection occurred from time to time.

As I read between the lines from these experiences the reports of various Russian clinics, there seems no question that the maternal mortality and morbidity is less with legalized abortion than it was with secret abortions before the war, but this mortality does not reach the zero percentage claimed by some officials. More and more, however, we find evidence in Russian literature of the harmful psychic effects, gynecologic lesions and secondary sterility coming as an aftermath to these procedures, so that a movement to restrict legal abortions is again gaining ground.

Both Professor Braude and Professor Wittenberg were deeply interested in the work of American gynecologists and hoped at some time to be able to see this country. They longed for the time when America would send out the call for the long-postponed International Congress of Gynecology and Obstetrics. Sixteen years have elapsed and no one has seen fit to make the first move. Our Russian colleagues are eager for the friendships and stimulation that such a Congress would bring.

FRED J. TAUSSIG, M.D.

3720 WASHINGTON BOULEVARD, ST. LOUIS.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

Review of New Books

Prof. Ludwig Nürnberger of Halle a.S. has written the second half of the fifth volume in Stoeckel's *Handbuch der Gynäkologie*.¹ The entire volume of 788 pages deals with the diseases of the vagina. Hence it is extremely detailed and covers a large amount of casuistic and literature, with a fair degree of uniformity although the American literature has not been scanned as closely as that of European countries.

Glycogen is found in the vaginal epithelium of the fetus. The great absorptive power of the vagina is emphasized and poisoning occurring through this portal of entry is discussed in detail. Nürnberger disagrees largely with Dierks and others in that he finds no definite change in the vaginal mucosa ascribable to the cycle. However, in pregnancy and labor distinct differences in the epithelium are noted. Stieve's important work on the pregnancy changes in the connective tissue in the pelvis, as well as in the musculature, are fully described.

A large amount of space is devoted to the vaginal flora, including its bacteriology, the difference between the child, adult, and senile individual, the hydrogen-ion concentration and the metabolism. Fluor is divided into tubular, uterine, cervical and vaginal. The author does not agree with Schroeder's theory in which so much of the bacterial changes are ascribed to the variation in glycogen content of the epithelium. He agrees more with Niderehe, v. Jaschke and Menge. The self-cleansing of the vagina and elimination of pathogenic bacteria is featured. Moreover, vestibular neurogenic and psychogenic fluor is stressed. Much importance is placed upon the diagnosis of the origin of fluor and although local treatment is fully described, general measures are greatly emphasized. Under inflammations every phase is fully discussed. An excellent description of colpitis emphysematosa as well as a full discussion of *Trichomonas vaginalis* will be found in these pages. Other main topics are syphilis, ulcus molle, injuries, and ulcers. Tumors of the vagina are described. A very excellent description of sarcoma botryoides in children is given. Among diffuse adenoma of the vagina, I notice that Plaut's case is omitted. A large amount of space is devoted to adenomyoma as well as to carcinoma.

This book will be found to contain a complete description of conditions of the vagina, except that some of the world's literature has been omitted. If anything, the text has been kept somewhat too impersonal and is strictly along conventional lines. This volume contains 271 beautiful illustrations, many of them in color, the great majority of which are from other sources to whom due credit has been given.

—Robert T. Frank.

¹*Handbuch der Gynäkologie. Dritte Auflage. W. Stoeckel. Fünfter Band. Zweite Hälfte. Die Erkrankungen der Scheide. Bearbeitet von Dr. Ludwig Nürnberger. J. F. Bergmann, München, 1930.*

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

THE OBSTETRIC LITERATURE OF 1930

By J. P. GREENHILL, B.S., M.D., F.A.C.S., CHICAGO, ILL.

IN GENERAL the obstetric literature of 1930 has been similar to that of previous years but special attention has been focused upon certain subjects. The number of papers devoted to various tests for detecting early pregnancy has increased enormously. Most of these articles deal with the Aschheim-Zondek test and a large proportion of them prove the reliability and usefulness of this test in the detection not only of early pregnancy but also of hydatidiform mole and chorion-epithelioma. A number of papers are devoted to a discussion of chorionepithelioma and some emphasize the value of radiation for the treatment of this malignant condition. A large share of the literature is devoted to medical complications in gestation. This indicates the increased recognition of the necessity of inviting the cooperation of medical consultants in the care of pregnant women. There is renewed interest in oxytocics and this is due to the increasing use of thyrophysin to shorten labor. Local anesthesia is finding more and more favor in obstetrics especially for the delivery of women who have toxemia of pregnancy and other complications.

PREGNANCY

Physiology.—According to K. Ogino,¹ conception in the human is impossible between the first and the eleventh days of the menstrual cycle and is almost limited to the period which extends from the twelfth to the nineteenth day. F. Wittenbeck² on the other hand, denies this and reports cases which prove that pregnancy may take place before the eleventh and after the nineteenth day. (H. Knaus³ agrees with Ogino and has done a good deal of experimental work in the attempt to prove his point. Theoretically a woman is capable of conceiving only for a short period after ovulation; that is some time between the twelfth and nineteenth days of the menstrual cycle. Since an ovum is capable of fertilization for only a few hours, and the spermatozoon's capability lasts not much longer, conception must, theoretically, take place a few hours after ovulation. Practically, however, it seems that many women are capable of fertilization at any time in the menstrual period. Accurate data are necessary to determine this point which has hitherto been undecided, because the information obtained depended upon the memory and truthfulness of women. Perhaps Hartman will help us out on this point as on many others, when he obtains more data from his studies on monkeys.)

A. Hermstein⁴ found that the tubal corners of the uterus are regu-

larly closed even in the first month of pregnancy and this closure is chiefly the result of the growth of decidua. (If this is universally true, then those who maintain that superfetation is impossible have a strong argument in their favor.) Experimenting with guinea pigs, H. L. Dawson⁵ found that in pregnant females the number of hairs which regenerate reaches a minimum at the time of delivery; hence there seems to be a negative correlation between the regeneration of hair and pregnancy. (Not all experimenters agree with this conclusion.)

The rôle of vitamins in pregnancy is thoroughly discussed by H. Vignes⁶ who emphasizes that these substances are necessary not only for the growth of the uterus and other organs but also important because they are transmitted to the newborn child. Vignes points out the results of the absence of each of the vitamins in the diet of pregnant women. (Obstetricians should appreciate the value of some of the vitamins for pregnant women and their unborn babies.)

A new pelvimeter for the measurement of the bispinous diameter is described by S. Hanson.⁷ The value of the roentgen ray in obstetrics is discussed by H. B. Matthews⁸ and also by J. R. Reinberger and P. C. Schreier.⁹ G. W. Grier¹⁰ emphasizes the value of the lateral x-ray view in the diagnosis of pregnancy and H. Thoms¹¹ explains how to determine fetal maturity in utero by means of the roentgen ray. The latter author¹² also points out that the only means of accurately measuring the transverse diameter of the superior strait is by means of x-ray pelvimetry. T. O. Menees, J. D. Miller, and L. E. Holly¹³ recommend the injection of strontium iodid through the uterus into the amniotic cavity to give contrast to the fetus and placenta. By means of this procedure the authors can occasionally determine the sex of the child and also the location of the placenta. (The amount of information which can be obtained by this procedure does not justify the risk of damage which may result.) D. S. Hillis¹⁴ describes how to diagnose contracted pelvis by an impression method without the aid of an assistant. Contrary to the usual opinion, J. Andérodias and R. Mareille¹⁵ maintain that the fetal head in primiparas usually does not become engaged until late in pregnancy or until after labor has begun. Therefore, nonengagement of the head in the last month of pregnancy is not a certain indication of dystocia. (The reviewer's experience has been that in the majority of primiparas, the fetal head is engaged before the onset of labor.)

During the past year increased experience has been reported with various tests to detect early pregnancy. Z. Bercovitz¹⁶ reports his studies on the pupillary reactions of pregnant women after the instillation of their own serum into the conjunctival sac. This test was positive in 80 per cent of one group and in 62 per cent of another series. E. Monilloff^{17, 18} reports two series of cases in which he employed his serum reaction for the determination of pregnancy. He reports positive results in 94 per cent of 2,238 cases, but M. Rodecort and C. Jernakoff¹⁹ say that this test is unreliable. H. Küstner²⁰ recommends the injection of hormone of the anterior lobe of the hypophysis to detect pregnancy. If the uterus contracts after the injection, the patient is pregnant. During the time the uterus contracts the patient loses consciousness and her face becomes pale. (This is a heroic test for information which is rarely urgent and which may be obtained either by a little patience or by the use of simpler and safer procedures.)

The test which has proved to be safe and reliable for the detection of early pregnancy is the Aschheim-Zondek test. Among the reports which have appeared this year may be mentioned those by B. Zondek,²¹ E. M. Robertson,²² B. Stone,²³ J. Kreis,²⁴ F. A. E. Crew,²⁵ B. Parvey,²⁶ H. Allan and F. Dickens,²⁷ H. M. Evans and M. E. Simpson,²⁸ F. A. Wahl,²⁹ H. C. Mack,³⁰ and G. Liese and E. S. Auer.³¹ The Aschheim-Zondek test was modified by L. Brouha, H. Hinglais and H. Simmonet³² who employed male infantile mice instead of females. These authors claim that their modification enables them to make 100 per cent correct biologic diagnoses. E. J. Krans³³ independently put this modification into practice at the same time as the French authors, but he believes that whereas the new procedure can supplement the original Aschheim-Zondek test, it cannot replace it. S. Aschheim³⁴ condemns the new modification because first of all it requires ten days to know the result and second because Kraus found that urines which in female infantile mice yielded only reaction I (this is not characteristic of pregnancy) produced in male animals the customary enlargement of the male genitalia which is considered characteristic of pregnancy. Hence the test which employs male mice is not reliable. K. Ehrhardt³⁵ obtained the Aschheim-Zondek reaction from the urine of nonpregnant women by injecting large amounts of hypophyseal hormone into the blood of these women. As a protection against the misuse of the Aschheim-Zondek test, A. Stern³⁶ issues the following warnings: To be sure the urine is obtained from the proper person, it should be drawn off by catheter; the test should be performed only by a physician and only with the sanction of the patient. The results should be communicated to the patient herself not by telephone but by mouth or by letter.

E. Philipp³⁷ takes issue with Aschheim and Zondek on the source of the so-called hypophyseal hormone. The latter authors maintain that most of this hormone is produced by the anterior lobe of the pituitary gland but Philipp is of the firm belief that the products of pregnancy, especially the placenta is the source. Hence the Aschheim-Zondek reaction is not a hypophyseal but a placental reaction. E. Fels³⁸ agrees with Philipp.

A. R. Bacon³⁹ found that hypophyses from pregnant cattle were poorer in hormone than the hypophyses from nonpregnant animals, in spite of the fact that the hormone content of the blood in the former is vastly greater. Likewise K. Ehrhardt and B. T. Mayes⁴⁰ found no anterior lobe hormone in six hypophyses obtained from pregnant women but did find this hormone in 30 out of 32 hypophyses taken from nonpregnant individuals. (The important and highly practical investigations of Aschheim and Zondek have stimulated workers all over the world to follow up and utilize the results of these studies. Nearly all authors are agreed that the Aschheim-Zondek test is one of the most notable achievements in obstetrics in recent times. This test is of value not only in the detection of early pregnancy but also of hydatidiform mole and chorionepithelioma. Should a chorionepithelioma develop after the removal of a hydatidiform mole, its presence can be detected with a great degree of certainty by the Aschheim-Zondek test. Likewise recurrence of chorionepithelioma may be diagnosed early by this test.)

C. G. Hartman⁴¹ describes vividly the reproductive phenomena in the monkey. He has observed bleeding early in pregnancy in every one

of 18 pregnancies among these primates. C. U. Moore, H. G. Dennis, and B. I. Phillips⁴² recommend that pregnant women take 10 to 20 drops of activated ergosterol from the third to the beginning of the ninth month of gestation in order to prevent rickets in the newborn.

Abortion.—B. Beuthner⁴³ praises the intrauterine application of charcoal in the treatment of abortion and believes its good results are due to the fact that it has absorptive properties and therefore prevents the penetration of bacteria into the tissues. J. Olow⁴⁴ favors active treatment for febrile abortions as well as for afebrile ones. On the other hand, K. Sommer and H. Ziegeler⁴⁵ report that each year they become more and more conservative in the treatment of septic abortion. H. Reichelt⁴⁶ is of the opinion that the treatment of abortion should be neither active nor entirely expectant but individual. (The reviewer believes by far the best results in febrile abortion are to be obtained by conservative therapy. The only indication for interference is profuse or persistent bleeding. The uterus can usually be emptied of retained products of conception by the administration of quinine and pituitary preparations.)

Roentgen-ray abortion for therapeutic reasons is condemned by K. Bollag⁴⁷ because first of all, the abortion may not follow the roentgen-ray treatment for a long time, second, in many cases there is retention of the ovum, bleeding and infection, third, there is a bad effect on the patient especially if she must wait months for the abortion to take place, and fourth, not all roentgenologists know how to produce abortions by means of the x-ray, hence when failures occur, idiots or monsters may be born. (It is much more certain and almost as safe to perform a therapeutic abortion by an operative procedure, using local anesthesia in most of the cases.)

Complications.—The prognosis of heart disease in pregnancy is discussed in two papers by W. D. Reid,^{48, 49} who believes that probably 90 per cent or more of cardiac patients survive pregnancy and parturition. This author maintains that married women with heart disease die before their time because of the natural evolution of heart disease rather than because of childbearing. G. Herrmann and E. L. King⁵⁰ discuss cardiovascular disturbances in obstetric patients with special reference to electrocardiographic observations. In a study of 24 cases they found that ether predisposed to fatal pulmonary edema in patients with the pulmonary congestion of mitral stenosis. Of the general anesthetics, ethylene is the best, but the safest of all is local anesthesia. P. A. Daly⁵¹ outlines the management of cardiac patients during pregnancy. He maintains that if failure does not occur during the long months of gestation it seldom takes place because of labor. J. Meyer, J. E. Lackner and S. S. Schochet⁵² review the literature on paroxysmal tachycardia in pregnancy and report a case of their own. In the majority of cases the condition is well tolerated. (In the management of pregnant women who have cardiac complications the obstetrician should seek the advice and cooperation of a cardiologist. Most deliveries in women with heart disease may safely be accomplished from below but in a definite proportion of these women the safest and simplest form of delivery is cesarean section under local anesthesia aided by morphine or pantopon.)

A study made by J. L. Reyecraft⁵³ a few years ago revealed that at least 30 per cent of the women of childbearing age in Ohio have hypertrophy or hyperplasia of the thyroid. This author recently examined

300 pregnant women and found that 52 per cent had an appreciable enlargement of the thyroid. He recommends that some form of iodine therapy be instituted almost systematically to prevent goiter. In the Lahey clinic, H. M. Clute and D. H. Daniels⁵⁴ found that the incidence of pregnancy in 3,678 cases of hyperthyroidism was 0.41 per cent. When properly treated hyperthyroidism does not cause an unnatural termination of gestation in most cases. Pregnancy, however, is an added burden in hyperthyroidism and should be avoided if possible. Thyroidectomy for primary hyperthyroidism may be undertaken during pregnancy with safety to both mother and child. It is the belief of J. W. Hinton⁵⁵ that 90 per cent of cases of hyperthyroidism associated with pregnancy can be carried to a normal delivery if properly managed. (Most pregnant women should be given iodine in one form or another, especially those who live in the so-called "goiter-belts." However, care must be exercised because in women who have adenomas without symptoms of hyperthyroidism, the latter may be precipitated by the liberal use of iodine.)

E. C. Hartly⁵⁶ describes a group of symptoms in pregnancy under the heading of tetanoid syndrome. Among these symptoms are cramp-like or aching pains in the legs and thighs, an unusual irritability of disposition, insomnia, often edema of the extremities not associated with cardiac or nephritic pathology and parasthesias of the extremities. The treatment of this syndrome includes the oral administration of calcium, the use of parathormone and irradiated ergosterol.

Two cases of diabetes in pregnancy are reported by H. Neviny and G. Schretter.⁵⁷ In both cases the diabetic condition improved toward the end of gestation and became worse during the puerperium. These authors are opposed to Holzbach's belief that the fetal pancreas takes on some of the function of the mother's pancreas. They review the literature on the subject of diabetes in pregnancy and append an extensive bibliography. H. Bowcock and J. R. McCord⁵⁸ report the occurrence of diabetes during pregnancy in a woman who gave birth to large babies. (Thanks to insulin, diabetes in pregnancy is no longer as serious a complication as it formerly was. However, in an occasional case insulin will not prevent the progress of diabetes during gestation and the latter will have to be terminated.)

It has been the rare fortune of H. Vignes⁵⁹ to have observed ten patients who had asthma during gestation and these ten women had 26 pregnancies. Nine of these gestations ended as spontaneous abortions and in three instances therapeutic abortions were performed. No serious mishaps were seen in any of the cases. A. C. Williamson⁶⁰ also presents a study of cases of asthma and hay fever associated with pregnancy. This author found that the asthmatic group bore out the part played by heredity in transmitting the tendency to the disease because every child showed an eczema or a food idiosyncrasy. Williamson found that women with asthma seem to have less frequent attacks during pregnancy and the puerperium. The treatment during gestation is the same as in the nonpregnant state.

H. L. Barnes and L. R. P. Barnes⁶¹ analyzed questionnaires pertaining to 410 pregnant tuberculous women. They believe that a woman with active tuberculosis should avoid pregnancy in order to be spared the extra work and worry of a baby and that the baby may be spared the risk of infection. Pregnancy in itself has a harmful influence in only a small percentage of cases and abortion, being unnecessary in

the majority of the favorable and futile in most of the unfavorable cases, is rarely beneficial to tuberculous women. H. B. Matthews and L. S. Bryant⁶² studied the obstetric histories of 484 patients who graduated from the Trudeau Sanatorium. They found that pregnancy had a deleterious effect on tuberculous women. The women who took sufficient time before becoming pregnant after being "cured" (three years or more) and who obeyed all the rules, fared better than those who did not. Out of 579 children, 556 are alive and 501 are well. Only 9 have tuberculosis. (With increasing knowledge about the association of pregnancy and pulmonary tuberculosis we are becoming more and more conservative in treating pregnant tuberculous women. It is rarely necessary to interrupt gestation and if this is not done during the first three months it is far safer to permit the pregnancy to continue to term. In the delivery of tuberculous women, local anesthesia should be used in preference to any other.)

A number of papers have appeared on the subject of anemia in pregnancy. P. B. Bland, L. Goldstein and A. First^{63, 64, 65} in three papers report that 47.4 per cent of 1,000 pregnant women had a red cell count of 3,500,000 or less. The most interesting feature of this study was the remarkable recovery which the women made within two to six months after delivery. In a series of 300 pregnant women, J. H. Moore⁶⁶ found that fully 50 per cent showed a reduction in hemoglobin readings and red blood cell counts, sufficient to place them in need of therapeutic measures to combat the anemia. B. C. Nalle⁶⁷ and Y. Suwa⁶⁸ likewise discuss the question of secondary anemia in pregnancy whereas K. Heim⁶⁹ and R. Peterson, H. Field and H. S. Morgan⁷⁰ report cases of pernicious anemia during gestation. Heim believes that these cases of pernicious anemia belong in the category of the toxemias of pregnancy. The latter authors report three cases successfully treated by means of liver and blood transfusions. (It is gratifying to see the increasing attention paid to a study of the blood in pregnancy. Since at least 50 per cent of all pregnant women have anemia, it is imperative that obstetricians include blood counts in their routine prenatal care. When a red count of 3,500,000 or less, or a hemoglobin of 70 per cent or less is found, the patient should be treated intensively by means of diet, arsenic, iron, ultraviolet light and occasionally by the intramuscular injections of whole blood.)

An excellent paper on syphilis and pregnancy is presented by J. R. McCord⁷¹ who proves indisputably the horrible results of the positive blood Wassermann reaction in pregnant negroes and the value of antiluetic treatment during gestation. Pregnancy ended disastrously in 80 per cent of women who received no treatment, whereas with good prenatal antisyphilitic treatment, 93 per cent of the babies were born alive. Another interesting article on this subject is that by U. J. Wile and J. W. Shaw⁷² who likewise show that prenatal treatment of syphilis results in a great decrease of fetal deaths. These authors emphasize that regardless of clinical or serologic observations it is best to treat babies born of mothers in whom the syphilis is early, to supplement the prenatal treatment of the mother. (These two papers are worth rereading.)

As previously mentioned the Aschheim-Zondek test has proved to be valuable not only for the diagnosis of early pregnancy but also for the detection of hydatidiform mole and chorionepithelioma. S. Aschheim⁷³ himself describes the technic and results and mentions its use-

fulness in hydatidiform mole and chorionepithelioma. H. E. Mack and A. E. Catherwood,⁷⁴ F. Schultze-Rhonhof,⁷⁵ W. Haupt,⁷⁶ K. Ehrhardt⁷⁷ and O. Fahlbusch⁷⁸ report cases showing the value of the Aschheim-Zondek test in the diagnosis and treatment of these neoplasms. Nearly all are agreed that the presence of a hydatidiform mole or a chorionepithelioma produces a marked increase in the amount of hormone of the anterior lobe of the hypophysis in the urine and hence a strong Aschheim-Zondek test. If after removal of the newgrowths, the test becomes negative, the prognosis is good. If, however, the test remains positive for a long time it is an indication that all the disease has not been removed or that a hydatidiform mole has become converted into a chorionepithelioma or that a recurrence has taken place. B. Zondek⁷⁹ recommends a new test for the diagnosis of chorionepithelioma, namely, the determination of the content of the pituitary hormone in a piece of tissue excised or removed by means of a curette. To determine the presence of hormone the tissue is implanted into animals after detoxication.

E. Novak and A. K. Koff^{80, 81} discuss the question of chorionepithelioma and emphasize certain facts. While ordinarily this condition is extremely malignant it runs a favorable course in about 10 per cent of the cases with either spontaneous cure or cure after an incomplete operation. Further, in a considerable number of cases in which extensive metastases have occurred, no trace of the original tumor can be found. A third fact is that both chorionepithelioma and hydatidiform mole are often associated with characteristic changes in the ovaries. In one paper Novak and Koff deal with the disappearance of the primary uterine tumor in cases of chorionepithelioma, whereas in another article they discuss the ovarian and pituitary changes associated with both hydatidiform mole and chorionepithelioma and report four cases of their own. H. Schmitz and W. Hueper⁸² emphasize that all tissue expelled during an abortion, full-term labor or as a hydatidiform mole should be examined for a newgrowth of the chorion. They believe that hysterectomy is the operation of choice for chorionepithelioma even if metastases are present and radiation combined with surgery may improve the results of surgery. Z. v. Szathmary⁸³ cites the reports of four cases of chorionepithelioma cured by roentgen-ray treatment alone and seven additional cases where radium was used. He suggests that elderly women who have hydatidiform mole should be treated with small doses of radium prophylactically.

G. W. Gustafson⁸⁴ discusses *Trichomonas vaginalis* vaginitis complicating pregnancy. (Increasing attention is being paid to the leucorrheal discharge which is associated with the *Trichomonas vaginalis*. Most authors have found that when this condition exists during pregnancy, there is a greater tendency to puerperal morbidity. Women may safely be treated during pregnancy and they can assist the treatment by taking 0.5 per cent lactic acid douches.)

L. A. Wilson⁸⁵ takes up the subject of pregnancy and labor associated with granuloma inguinale, P. B. Bland and L. Goldstein⁸⁶ review the subject of pregnancy and Parkinsonism, and J. P. Greenhill⁸⁷ writes on necessary pelvic and abdominal operations during pregnancy.

The Toxemias.—The studies of H. Frey and E. Herrmann⁸⁸ lead them to conclude that in pregnant women there exists a more pronounced vestibular reaction than in nonpregnant women. This is particularly

noticeable in the early months of gestation and especially among those who complain of vomiting. P. A. Cabanes⁸⁹ claims he cured eleven cases of hyperemesis by the production of fixation abscesses or the injection of aseptic pus but he adds that the diet was also important. P. Caffier⁹⁰ advocates the glucose and insulin treatment of hyperemesis but warns that this therapy may be dangerous. He observed two cases of hypoglycemia shock and three cases of beginning hypoglycemia among 20 patients so treated. J. Hofbauer⁹¹ takes issue with Caffier and points out that in cases of excessive vomiting, abortion occurs just as frequently among women who do not receive the glucose-insulin therapy as among those who do. Hofbauer showed that insulin protects the liver and kidneys against damage. H. Saenger⁹² was able to find in the entire literature only 34 reports of autopsies on patients who died of hyperemesis. In most of these cases too long a time had been permitted to elapse before therapeutic abortion was performed. None of the deaths occurred before the tenth week of pregnancy. (The reviewer's treatment of hyperemesis has not changed during the last few years. He still relies upon isolation, rest in bed, forced fluids, glucose administered subcutaneously and intravenously, sedatives including sodium luminal, duodenal feeding and a liberal amount of psychotherapy. Thus far he has been fortunate but there will most likely be an occasional patient who will not improve and who will have to have her pregnancy interrupted. The important thing is not to let the condition progress so far that a therapeutic abortion is too late to be of any avail.)

G. W. Theobald⁹³ points out the rarity of the toxemias of pregnancy in Siam and other countries in the far East. He also⁹⁴ expresses the belief that eclampsia is caused by toxins which are absorbed from the intestinal canal and which owing to a breakdown in the defenses of the body are not detoxicated. D. I. Macht and J. R. Losee⁹⁵ made a phytopharmacologic study of the bloods from eclamptic patients and failed to find any poisonous substance which is toxic for certain living seedlings.

Liver function tests in the toxemias of pregnancy are discussed by E. L. King⁹⁶ who feels that these tests do not furnish any evidence regarding prognosis which cannot be elicited by a careful clinical study. H. J. Stander, N. J. Eastman and E. P. H. Harrison⁹⁷ studied the acid-base equilibrium of the blood in the late toxemias of pregnancy. N. J. Eastman⁹⁸ investigated the serum proteins and H. J. Stander and N. J. Eastman⁹⁹ the H-ion concentration in these toxemias.

Seven additional serial blood-sugar curves are reported by P. Titus, E. W. Willets, and H. D. Lightbody¹⁰⁰ to confirm their contention that there is a wide fluctuation in blood sugar in exceedingly short intervals of time during an eclamptic seizure. These curves as well as the preceding twelve show that it is characteristic for convulsions to be preceded by sharp falls in blood sugar; periods which have been called "relative hypoglycemia." Titus considers dextrose to be specific treatment for eclampsia and preeclampsia.

L. Dorsett¹⁰¹ in one article as well as in another written with O. H. Schwartz¹⁰² advocates conservatism with chief reliance upon magnesium sulphate and glucose for the treatment of the late toxemias of pregnancy. W. T. McConnel¹⁰³ recommends the continuous drip method of administering glucose intravenously for these toxemias. J. L. Reycraft¹⁰⁴ believes that hepatic extract is of considerable value

in these cases but "should not be used to the exclusion of other types of treatment, including the use of sedatives, elimination, etc., and it is most beneficial in the more severe types of cases when combined with the liberal administration of glucose." J. H. Moore¹⁰⁵ reports good results in four toxemic patients treated with sodium amytal.

V. J. Harding and H. B. Van Wyck¹⁰⁶ found that the administration of hypertonic saline solutions in the toxemias is harmful. These authors have no fear of giving high protein diets not only to pre-eclamptic but also to eclamptic patients but they advocate a salt-free diet as the essential thing in the treatment of the toxemias of pregnancy. Other papers on the prevention and treatment of the late toxemias of pregnancy have appeared by L. Seitz,¹⁰⁷ M. E. Davis,¹⁰⁸ W. O. Klein,¹⁰⁹ C. B. Upshaw,¹¹⁰ J. R. Reinberger and P. C. Schreier,¹¹¹ E. Thulin,¹¹² N. Gyllewsvard,¹¹³ P. Rissman,¹¹⁴ B. Stroganoff¹¹⁵ and many others. Stroganoff now treats most of the eclamptic patients in Leningrad by giving advice over the telephone.

J. C. Llames-Massini¹¹⁶ performed 16 cesarean sections for eclampsia without a maternal or fetal death, and H. W. Johnson and R. A. Johnston¹¹⁷ report 25 cases of late toxemia of pregnancy delivered by cesarean section under spinal anesthesia. All the mothers recovered and only one baby died. (The best treatment for the large majority of eclamptic patients is ultra-conservatism, i.e., the administration of narcotics and sedatives including magnesium sulphate, glucose, and perhaps purgatives, but nothing else. Gastric lavage, colonic irrigation and hot packs frequently do harm. The pregnancy should be left alone. In the hands of trained obstetricians, however, the best results will be obtained by emptying the uterus in the safest possible manner. This usually means delivery from below but not by accouchement forcé. In a certain number of eclamptic women cesarean section is indicated. Regardless of how an eclamptic patient is delivered, *only local anesthesia* should be used if an anesthetic is necessary.)

R. Kobes¹¹⁸ reexamined 51 patients of whom 32 had previously had eclampsia and 19 had had preeclampsia. Not one of the eclamptic patients developed chronic nephritis but at least two of the 19 women with preeclampsia showed this condition. However, many women complained of severe headaches following eclampsia and this indicates injury to the central nervous system. Since the best test of kidney function in women who have had toxemia is another pregnancy, S. Berman¹¹⁹ studied 225 women who had more than one pregnancy following a toxemia at the Boston Lying-in Hospital. He concludes that the incidence of cardiovascular-renal disease increases with each succeeding pregnancy. Once a patient has had toxemia she should be studied most carefully between pregnancies and in future gestations receive exceptional prenatal care. F. J. Browne and G. H. Dodds¹²⁰ has shown in rabbits that chronic renal damage may exist during the intervals between pregnancies and yet give no clinical indication of its presence. These observations suggest that in the so-called "recurrent toxemias of pregnancy" there is all the while a mild degree of chronic renal damage which undergoes exacerbations under the strain of pregnancy. (The reviewer¹²¹ has likewise found that many women who recover from having had toxemia of pregnancy show signs of toxemia in subsequent pregnancies in spite of the fact that they are apparently normal between pregnancies.)

LABOR

General.—M. Luis Perez¹²² withdrew between 50 and 300 c.c. of blood from women in active labor and injected the blood intravenously into 50 pregnant women who were past term. In 50 to 60 per cent of these cases labor was successfully induced. In an elaborate experimental study of the dog and rabbit, L. Rudolph and A. C. Ivy¹²³ report on the mechanism of labor studied under direct observation, the effect of stimulation and section of the extrinsic nerves of the uterus, the effect of certain drugs on the uterus in situ by the use of a method which graphically records uterine motility and also experimental rupture of the uterus.

A comparative study of H. W. Mayes and S. Ullian¹²⁴ of the bacterial flora of the birth canal with and without the use of mercurochrome as a vaginal antiseptic showed that following the use of mercurochrome the number of positive vaginal cultures was reduced from 44 to 6 per cent, positive cervical cultures from 16 to 4 per cent, and positive membrane cultures from 32 to 6.4 per cent. (For the last few years I have been using mercurochrome routinely before and after labor in every patient delivered vaginally but I am still not certain that it has made much difference in morbidity. I shall, however, continue to use it.)

J. M. Laferty¹²⁵ has found Tweedy's rules for conducting a test of labor to be most useful. These rules are as follows: When the mother's pulse rate increases and the temperature rises above 100 degrees F. interference is indicated on behalf of the mother. When the fetal heart sounds rise above 160 or fall below 120 on three successive counts of one minute intervals, interference is indicated on behalf of the baby. (It is not advisable to follow such fixed rules in every case for there are many exceptions. Furthermore fever during labor is *not* an indication to perform an operative delivery. It is far safer to wait for spontaneous delivery.) C. C. Norris¹²⁶ considers a dry labor as a complicated labor and one which can most advantageously be treated in a well-equipped maternity hospital. If labor does not begin within twenty-four hours after the membranes rupture, a therapeutic induction is usually indicated, preferably by the Watson method. If this fails a rectal tube or a colpeurynter should be used. D. A. Mitchell¹²⁷ recommends the suggestion of Philip Jones, namely, the routine administration of small doses of quinine for three weeks before labor is expected. No harm was observed in over 400 cases where quinine was given in this way. (Quinine occasionally does do harm. There is absolutely no necessity for interfering with normal pregnancy in this manner.)

In a discussion on the mechanism of labor, A. J. Rongy¹²⁸ maintains that when the fetal head enters the pelvis with its neck near the sacral promontory, as in occipitoposterior and mentoposterior positions, spontaneous delivery of the child is either difficult or impossible. When, however, the fetal neck is close to the pubic arch as in occipitoanterior and mentoanterior positions, spontaneous delivery is the rule.

A statistical study made by L. A. Calkins, J. H. Irvine and G. W. Horsley¹²⁹ led them to controvert the beliefs in the long labor of the stout woman, of the elderly primipara, and of the woman with a small pelvis or a large baby. (These statements should be corroborated on a much larger series of cases.)

During the last two years a number of papers have appeared on the use of thymophysin. N. Temesvary,¹³⁰ its originator, read a paper in this country in which he advocated this drug to shorten labor. In an experience of many thousand cases, he never observed any harmful results. M. Davis¹³¹ reports a series of 50 cases in which he found the drug to be very helpful. J. Jareho¹³² also claims his results were very encouraging. Other authors who report good results are F. Holtz,¹³³ J. S. Diasio,¹³⁴ and L. W. Haynes,¹³⁵ who analyzed a series of 500 cases. On the other hand, F. Pachner¹³⁶ reports a case of spontaneous rupture of the uterus after the use of thymophysin. K. Kaiser¹³⁷ takes issue with Pachner and believes the latter should have reported his case as "Another Uterine Rupture Following the Injudicious Injection of an Oxytocic." E. Puppel¹³⁸ has given up the use of thymophysin because it frequently altered the fetal heart tones to such an extent that he had to hurry and deliver the babies. E. Graff¹³⁹ criticizes Puppel's paper and also Pachner's report of uterine rupture. He speaks very highly of thymophysin and says that the slowing of the fetal heart tones after the use of thymophysin does not frighten him because they quickly become normal again. H. W. Schoeneck and F. J. Schoeneck¹⁴⁰ used thymophysin in 35 cases and found it to be a powerful uterine stimulant, its action occasionally simulating pituitrin. They advocate small doses. M. P. Rucker¹⁴¹ studied the behavior of the uterus after the use of thymophysin by means of the kymograph in four cases and found that the character of the contractions were dangerous to mother and child. The response when positive was incomplete tetanus lasting from sixteen to twenty-four minutes. (I am responsible for having secured the opportunity for Dr. Temesvary to read his paper on thymophysin in this country last year. After Dr. Temesvary left I began using thymophysin and found that the drug shortened labor considerably without apparently doing harm. However, in writing and speaking of this drug I emphasized that it should be used *only* for cases where the pains have slowed down in frequency and strength, *only* in 3 minim doses and *only* in the first stage of labor. Recently adverse criticism began to appear against thymophysin. I therefore arranged with the president and chief chemist of the Wilson Laboratories to supply me with ampules which contain only one-fourth the strength of pituitary substance sold on the market. I have thus far used this 25 per cent pituitary substance in three minim doses in 30 cases where there were weak and infrequent pains during the first stage of labor and I found that the action of this weak pituitary was almost identical with that of thymophysin. I shall, however, withhold a definite opinion as to whether or not thymophysin is only the equivalent of weak pituitary until I shall have had a larger series of cases. The 25 per cent pituitary, like thymophysin, quickly reestablishes regular uterine contractions in the first stage when pains are infrequent and weak. If the patient is having false labor pains, these cease entirely shortly after the administration of pituitary. Neither thymophysin nor pituitary preparations should be given routinely to shorten labor.)

R. Mahon¹⁴² studied the effects of pituitary preparations and ergot by means of hysterography and maintains he never observed any increase in tonicity produced by pituitary substance. He believes that pituitary and ergot preparations have exactly the same effect on the uterus. However, he unqualifiedly condemns ergot and says it should

be replaced by pituitary substance in every obstetric case. (These findings are in disagreement with the results of Rucker and Haskell who found that pituitrin even in two minim doses can produce a marked tetanus of the uterus. Rucker and Haskell's results are much more reliable because they employed intrauterine hysterography whereas Mahon employed external hysterography. There have been enough reports during the last few years to indicate that pituitary substance at least in the strengths now sold on the market is dangerous in the first and especially in the second stages of labor.)

Analgesia and Anesthesia.—J. T. Gwathmey¹⁴³ reports a further study of his obstetric analgesia based on more than 20,000 cases. The results were excellent for both mother and child. P. T. Harper¹⁴⁴ makes a plea for the more general use of the Gwathmey method especially in the troublesome cases where the membranes rupture before the cervix is dilated. C. O. McCormick¹⁴⁵ devised a new apparatus for the instillation of the rectal-ether analgesia. H. S. Fist¹⁴⁶ claims to have produced very satisfactory analgesia by means of a combination of magnesium sulphate and scopolamine because these drugs are synergistic. C. B. Reed¹⁴⁷ is of the opinion that avertin definitely mitigates the pains of labor in most instances, it interferes but very slightly with uterine contractions, and does not appear to pass over to the baby. Likewise H. Naujoks¹⁴⁸ believes that avertin produces a painless labor and he advocates it as the best narcotic for patients with eclampsia. However, J. S. M. Connell¹⁴⁹ has not observed painless labors after avertin. He has nevertheless found the drug to be very helpful and recommends it. (The Council of Pharmacy and Chemistry of the American Medical Association¹⁵⁰ says the following: "Though the present evidence indicates that avertin may prove valuable as a means of initiating narcosis [so-called basis narcosis but not for complete narcosis] the Council decided not to admit the drug to New and Non-official Remedies.")

J. Putz¹⁵¹ and H. Goldschmidt¹⁵² both feel that pernocton is a useful twilight-sleep producing drug which has no harmful effects if properly used. J. J. Swendon¹⁵³ believes that the intravenous administration of sodium amytal induces satisfactory amnesia during labor. However, one-third of the babies are born apneic and require stimulation. (Our results with sodium amytal were not satisfactory.)

Records of intrauterine pressure have been obtained by A. W. Bourne and J. H. Burn¹⁵⁴ showing the effect of anesthetics on uterine contractions during labor. They found that chloroform and ether at once arrest the contractions in the first stage and diminish their force and frequency in the second stage. Gas and oxygen have no effect on the contractions during labor. Intraspinal injection of stovain does not inhibit the contractions but interferes with full relaxation between the pains. Morphine lessens the frequency of the contractions but the work done by the uterus is probably as great or greater than before. Atropine appears to stimulate the contractions but quinine has very little effect. A. Gremme¹⁵⁵ recommends the use of local anesthesia with perkain injected paracervically for the diminution of labor pains. T. Torland¹⁵⁶ favors novocain for the purpose of perineal block and K. Heim¹⁵⁷ recommends either direct infiltration or parasacral anesthesia. W. M. Bailey¹⁵⁸ believes that controllable spinal anesthesia is a safer, simpler and more efficient anesthetic procedure than inhalation anesthesia. H. W. Featherstone¹⁵⁹ recommends gas-oxygen for

most difficult vaginal operations but believes that spinal anesthesia is useful for cesarean sections. J. W. Burns¹⁶⁰ maintains that spinal anesthesia is the ideal method of dealing with pregnancy complicated by serious cardiac lesions and K. Wislanski¹⁶¹ reports 60 cesarean sections successfully performed under lumbar anesthesia. (The increased use of local anesthesia in obstetrics is to be commended. Direct infiltration is far safer than spinal anesthesia especially for pregnant women and hence should be used whenever possible. Episiotomy, low forceps operations and cesarean sections can readily be done under infiltration anesthesia.)

Complications.—For a long time E. D. Plass¹⁶² has been skeptical of the necessity for correcting retroversion of the uterus when it is detected after delivery. He has therefore treated a large group of patients in complete disregard for the position of the uterus and has seen no harm. He maintains that retrodisplacement is not a common cause of sterility and also that retrodisplaced pregnant uteri almost invariably are replaced spontaneously during the first four months of gestation. (The reviewer agrees with the statements made in this interesting paper. He seldom uses a pessary for postpartum retroversion of the uterus except for the rare, large, subinvolted, soft uterus.)

In a series of 1,750 abdominal and vaginal cesarean sections performed by I. W. Potter,¹⁶³ 16 subsequent ruptures are known to have occurred. Potter saw an additional case, and in the entire series of 17 cases, there were 3 maternal and 9 fetal deaths. H. Sachs¹⁶⁴ reports that among 20,800 labor cases there were 36 uterine ruptures (0.2 per cent). He found that two-thirds of the spontaneous ruptures occurred among multiparas which speaks for a deterioration of the uterine musculature after repeated pregnancies. The total maternal death rate was 53 per cent of which 33 per cent were due to infection. There was not a single instance of rupture in a previous cesarean section scar. A. von Probstner¹⁶⁵ reports five cases of rupture of the uterus caused by the injudicious administration of pituitary substance. Only one patient recovered. (The incidence of uterine rupture in Potter's series is unusually high. In more than 1,000 cervical cesarean sections performed at the Chicago Lying-In Hospital there has not been a single later rupture of the uterus as far as we know.)

Operative Obstetrics.—E. Waren¹⁶⁶ reports 31 cases in which on account of primary insufficiency of labor pains he prophylactically used a metal dilator to shorten the period of dilatation. This procedure required from two to ten hours. (There is no harmless way of instrumentally dilating the cervix of a full-term uterus.)

J. P. Greenhill¹⁶⁷ outlines the indications and conditions for the use of forceps and describes the technic of forceps deliveries and episiotomy. D. Miller¹⁶⁸ takes up the diagnosis and management of occiput posterior while R. J. Pieri¹⁶⁹ emphasizes the use of the modified Scanlon maneuver for the delivery of a head in this position. N. W. Vaux¹⁷⁰ reviews his results in 212 cases of occiput posterior presentation among which the total fetal mortality was 6 per cent. He favors "a timely internal version in occiput posterior positions, elective in type, when the cervix is fully dilated and the membranes unruptured in preference to watchful waiting and forceps delivery by Scanlon maneuver under like conditions." He performed version and extraction in 14.1 per cent of the 212 cases. (I agree with the quotation from

Vaux but I should like to emphasize that version and extraetion are operations for skilled obstetrieians only and not for general praetitioners. It is true that the latter do a great deal of harm delivering patients with foreeps but they will lose fewer mothers if they refrain from the frequent use of internal version.)

K. M. Wilson¹⁷¹ takes up the management of breech presentations and points out certain difficulties found in breech deliveries. (An attempt should be made in the last weeks of pregnancy to perform an external cephalic version. The latter should be performed with gentleness and the fetal heart tones should be controlled. The Trendelenburg position frequently simplifies this maneuver.)

S. Meeker¹⁷² reviews 193 versions and extraetions which he performed. In this series he used a bag 114 times. The total fetal mortality was 9 per cent which the author eorreets down to 3.1 per cent. Three mothers were lost (1.55 per cent). Meeker grants that delivery by version is not a popular method but he feels it is his "duty to relieve the mother of as much of the suffering of ehildbirth as possible when it can be done with safety." (Version is "safe" only in the hands of well trained obstetrieians and they constitute only a small number of the physieians who deliver babies in this country.)

P. Henriet¹⁷³ reviews 24 eases of extemporaneous evacuation of the uterus under spinal anesthesia at the end of pregnancy performed by Delmas and his associates. There was one maternal death and four fetal fatalities. Gonnet¹⁷⁴ reports four additional eases. This author believes the results of the Delmas procedure are very inconstant and it should be employed for strict indications only. (This procedure is nothing but an accouehement forcé and, therefore, should be condemned.)

As in previous years a large part of the obstetric literature deals with cesarean section. By far the most extensive analysis is that of E. v. Ammon¹⁷⁵ who found that the incidence of cesarean section in German and American clinics varied from 0.04 per cent to 17.3 per cent. Among 2,685 classic operations, the maternal mortality was 5.9 per cent, for 1,415 extraperitoneal operations 5.4 per cent, for 5,365 laparotraelotomies 4.1 per cent, and for 7,606 eases where different types of operations were used the death rate was 6.9 per cent. In the entire series of 17,071 cesarean sections there were 983 deaths (5.76 per cent) and infection was responsible for 67.2 per cent of them, embolus for 10.1 per cent, ilcus for 5.2 per cent, pneumonia for 3.6 per cent, anesthesia for 2.3 per cent, etc. The mortality for clean eases was 2.8 per cent, for suspicious eases 6.2 per cent and for unclean eases 9 per cent.

The next largest analysis is that by W. B. Thompson¹⁷⁶ who surveyed 1,322 abdominal deliveries performed in Los Angeles with a mortality of 4.2 per cent. In the list of 209 operators, 75 performed only one operation and 59 from two to five, whereas two physieians each performed 75 or more operations. Of 197 women who had previously had a cesarean section, four experienced a rupture of the uterus. W. Ilkewitz, M. Lewi, and S. Selitzky¹⁷⁷ studied 743 cesarean sections performed in Moskow during 1921-7. Praetieally all the operations were of the classic type and the mortality was 7.8 per cent. There were five ruptures of the uterus after the operation in this series.

The largest series of cesarean sections from one institution was reported by J. P. Greenhill¹⁷⁸ who analyzed 1,059 cesarean sections per-

formed at the Chicago Lying-In Hospital. The maternal mortality for 147 classic operations was 4.76 per cent whereas it was only 1.26 per cent for 874 cervical operations. There were no deaths after the 38 Porro operations. Local anesthesia alone by the infiltration of novocain was used in 55.1 per cent of all the laparotrachelotomy cases. There were five deaths among 495 cases of cephalopelvic disproportion (2.4 per cent), one death among 85 preeclamptic patients (1.2 per cent), one death among 16 patients with eclampsia (6.3 per cent), no deaths among 42 cases of placenta previa and two fatalities among 28 cases of abruptio placentae. As far as is known there has not been a single rupture of the uterus in this series.

W. C. Danforth and R. M. Grier¹⁷⁹ performed 124 laparotrachelotomies with only one death (0.8 per cent) whereas among 57 classic operations they experienced 3 deaths (5.2 per cent). They regard the cervical operation as definitely preferable to the older operation. R. Hasselblatt¹⁸⁰ observed a mortality of 2.9 per cent among 275 cesarean operations most of which were laparotrachelotomies. K. B. Steele¹⁸¹ reports a series of 59 extraperitoneal cesarean sections with a mortality of 8.5 per cent, L. Nürnberger¹⁸² observed three fatalities in a series of 60 such operations and emphasizes that drainage is essential and H. T. Burns¹⁸³ devotes a paper to the advantages, disadvantages and technic of this operation.

T. Kumamoto and S. Nakayama¹⁸⁴ performed cesarean sections on 24 rabbits. These animals were then mated and four conceived and had normal labors. The tissue around the cesarean scars was found to be much thinner than the rest of the uterus. W. Pokrowsky and J. Rabinowitsch¹⁸⁵ studied the scars after classic cesarean section and found that in about 50 per cent of the cases the uterine wall was completely healed in the region of the incision. However, the wall in the area of the incision was thin in more cases than was suspected and the authors feel that on the whole the classic operation does not give a satisfactory late result. (In 1929, J. P. Greenhill and B. Bloom¹⁸⁶ reported a histologic study of 37 scars removed at the time of repeated cervical cesarean sections. In some cases the wound had healed so perfectly that no scar tissue could be found whereas in others the scars were extremely thin. Most of the scars, however, were well healed. The above analyses indicate most definitely that the cervical operation is superior to the classic cesarean section. In spite of this, the average mortality for all cesarean sections is still unduly high. Because of this the indications for the operation should be limited and not extended as some suggest.)

L. Kropp¹⁸⁷ examined 150 women who had had cesarean sections and were capable of having more children and found that all except 66 became pregnant. Of these 66 women, 56 used contraceptives, hence secondary sterility after cesarean section occurred in only 7.5 per cent. B. J. Kouwer¹⁸⁸ likewise concludes that there is no relative sterility after cesarean section. In a series of 105 women who had had a cesarean section, C. M. McLane¹⁸⁹ observed that 62 had another cesarean operation, 26 delivered spontaneously and 17 had forceps deliveries or breech extractions.

Changes in the bladder were found by E. Scheyer¹⁹⁰ in a certain proportion of all women after all types of cesarean section especially the extraperitoneal type. The bladder was usually drawn over to one side. The ureteral orifices were distorted and edematous, and cystitis

was present in many cases. However, these changes have no clinical significance. E. Martin¹⁹¹ performed 462 vaginal cesarean sections for the following indications: placenta previa 225, premature rupture of the membranes 81, eclampsia 61, renal disease 28, etc. Three mothers died in the placenta previa series (1.3 per cent).

Uterine Hemorrhage.—K. Meyer¹⁹² found that in the last ninety years among 134,770 labor cases there were 770 cases of postpartum hemorrhage. Of this number 19 patients died (2.4 per cent) and of the latter 8 died of hemorrhage and 11 of sepsis. In 13,000 confinements, K. Skajaa¹⁹³ found 11 cases of postpartum hemorrhage in which the uterine blood coagulated normally during labor. However, 15-20 minutes or longer after the bleeding ceased, it began again and at this time the blood did not coagulate. Blood taken from a vein coagulated normally, hence the uterus was the seat of a local hemophilia. Shock is the basis for this type of hemorrhage and the only successful treatment is vaginal hysterectomy. Seven of the eleven patients died. P. Balard¹⁹⁴ reviews 50 cases of late puerperal hemorrhage in which the mortality was 20 to 25 per cent. In 26 cases there was retention of placental tissue, whereas in 24 cases there was none. In the latter cases severe puerperal infection was present.

J. P. Greenhill¹⁹⁵ outlines the present-day treatment of placenta previa and emphasizes the value of abdominal cesarean section under local anesthesia for cases of central or partial placenta previa. In infected cases, a Porro operation should be performed. Blood transfusion should be thought of and used more frequently than is the habit today. For marginal placenta previa and for some cases of partial placenta previa, Greenhill recommends the older methods such as rupture of the membranes with or without vaginal tamponade, Braxton Hicks version and metreuryesis. In a series of 118 cases of placenta previa the maternal death rate was 2.6 per cent. Of the 3 deaths one followed spontaneous delivery and the other two occurred after version and extraction. In the series of 42 cesarean sections and two Porro operations performed for placenta previa there were no maternal deaths. R. Kessler¹⁹⁶ reported a series of 107 cases of placenta previa with a death rate of 4.7 per cent. Among the 35 cesarean sections the only death was due to eclampsia. P. Balard¹⁹⁷ reports 36 cases of placenta previa treated conservatively with a mortality of 16.7 per cent and 12 cervical cesarean sections with no deaths. E. Puppel¹⁹⁸ observed 73 patients with this complication and 7 per cent died. However, among the 26 who were delivered by cesarean section all recovered. F. S. Kellogg¹⁹⁹ on the basis of 22 cases of placenta previa treated by abdominal delivery, believes this operation should be employed for cases of partial or complete placenta previa. E. v. Ammon²⁰⁰ reviewed the literature on this type of hemorrhage and found that among 330 spontaneous deliveries 3 per cent of the mothers died, among 3,280 Braxton Hicks versions 7.5 per cent died, among 705 cases where a bag was used 5.2 per cent succumbed, among 414 versions and extractions 10 per cent died, among 637 vaginal hysterotomies 6.6 per cent perished, and in a series of 2,320 cesarean sections 7.3 per cent were lost.

PUERPERIUM

General.—It is the opinion of E. Vogt²⁰¹ that mother's milk is one of the most important carriers of vitamins because it contains a large amount of vitamins A, B, and C. This is another argument in favor of

breast-feeding. A. E. Kanter and A. H. Klawans²⁰² discuss in detail the management of the puerperal period. Recently Stolte praised the value of sunlamp irradiation of lactating breasts for stimulating the milk supply. H. Küstner and R. Börner²⁰³ used this therapy in 21 cases, but failed to observe any increase in the flow of milk.

Improved breast and abdominal binders for maternity patients are described by I. Wilens.²⁰⁴ A series of 196 postpuerperal blood sera obtained six weeks after delivery by D. I. Macht and H. Leach²⁰⁵ were examined by phytopharmacologic methods. It was found that the phytotoxic index of these sera was higher than that of normal human female blood serum. In 536 out of 540 gravid women, P. B. Bland, L. Goldstein, and A. First²⁰⁶ found that sedimentation occurred more rapidly than in normal nonpregnant patients. The same sedimentation rates as occurred during pregnancy were maintained during the first ten days after delivery. However, the rates returned to normal within six months after delivery in practically all the cases. The same authors²⁰⁷ observed that in 77 per cent of 230 gravid women the blood platelets varied from 200,000 to 350,000 per c.mm. of blood whereas 18.2 per cent had more than 350,000. Hence these blood elements are not appreciably increased in pregnancy. However, 27 per cent of 100 women examined after childbirth gained over 50,000 platelets per c.mm. within twenty-four hours following labor.

Sepsis.—L. G. Baldwin²⁰⁸ reviewed the morbidity in a series of 300 cases and concludes that mercurochrome did not reduce the maternal morbidity to any marked degree, and that operative procedures other than cesarean sections and forceps deliveries did not increase the morbidity. H. A. Miller, D. B. Martinez, and M. E. Hodgson²⁰⁹ recommend cauterization of the cervix during pregnancy by means of an electric cautery in cases where there are erosions. They have seen no harm in 2,000 cases and believe this procedure is a prophylactic measure against puerperal sepsis. (The reviewer has cauterized the cervix during pregnancy many times but chiefly for erosions which had a tendency to bleed slightly. No bad results were found.)

True hemolytic streptococci were isolated by J. Taylor and H. D. Wright²¹⁰ from the vaginas of 32 out of 1,123 women immediately after delivery (2.7 per cent). However, none of these organisms gave rise to infections in the puerperium. L. Colebrook and R. Hare²¹¹ conclude from their study that infection with *Streptococcus pyogenes* is a comparatively infrequent cause of the minor febrile disturbances of the puerperium. A. L. K. Rankin²¹² also reports a bacteriologic study of puerperal infection.

T. K. Brown²¹³ points out that whereas puerperal infections due to ordinary pathogenic organisms in most cases are introduced from the outside, infections due to anaerobic streptococci are usually endogenous. L. Colebrook²¹⁴ isolated anaerobic streptococci from the blood of 17 patients who had puerperal fever and seven of these women died (39 per cent). In a series of 98 normal pregnant women spirochetes were observed by A. F. Lash²¹⁵ in vaginal smears in three instances (3 per cent) and among 118 patients with puerperal infection, spirochetes were found in the cervical secretion of 8 women (6.8 per cent). M. Gundel and K. v. Oettingen²¹⁶ found bacteria in the uterus of half of their pregnant women. The most common bacteria were Doederlein's bacilli and these came from the vagina. In a series of 374 fetal blood cultures examined by A. J. Kobak,²¹⁷ 9 per cent were positive.

This author found that the fetus may have a temporary bacteremia without any outward effects. The bacteremia occurs frequently as an ascending infection after prolonged rupture of the membranes.

W. A. Dafoe²¹⁸ found that 32 per cent of the morbidity in his cases were due to puerperal sepsis and in over 50 per cent of these, the *Streptococcus hemolyticus* was the causative organism. He maintains that when this organism is found in the cervical canal during the puerperium it is always a source of danger. He says that scarlet fever antitoxin has a special value in the treatment of puerperal and post-abort cases of sepsis due to this organism.

According to H. Burt-White, L. Colebrook, G. Morgan, J. W. Jarvis, and E. Harre,²¹⁹ there is a suggestion that women with positive Dick reactions show an increased susceptibility to puerperal morbidity. However in view of the comparative rarity of streptococcal infection, there is no need for the active immunization of all expectant mothers not even of all who are Dick-positive. The investigations of L. Stent²²⁰ in 500 cases show that immunity to streptococcal toxin measured by the Dick test did not decrease the liability to a morbid puerperium. H. Burt-White²²¹ treated 27 cases of puerperal sepsis with scarlet fever antitoxin serum and 29.6 per cent of the patients died. In view of these results and the reports of others the author concludes that the existing statistics for this treatment are of doubtful significance.

W. W. King²²² submits the records of 24 puerperal patients who were apparently infected from throats of attendants, and he recommends the use of masks which completely cover the mouth and nose by all persons present when the vulva is exposed during labor or the puerperium. Likewise E. F. Murray²²³ is of the opinion that an individual with an acutely septic sore throat may cause puerperal sepsis by coughing on the hands, dressings, instruments or on the patients. (These papers emphasize the necessity for masking both nose and mouth of all people who come in contact with women in labor. Likewise obstetricians should avoid contact with fresh, septic and autopsy material, bacteriology laboratories, patients who have a contagious disease, etc.)

In experimentally infected uteri of dogs, J. A. Meyer²²⁴ found that intravenous injections of acriflavine had a beneficial effect. The earlier the dye was given the better the effect. J. F. Baldwin²²⁵ has performed total hysterectomies in 90 severe cases of puerperal infection and has had a mortality of 25.5 per cent. He claims to have saved the 67 mothers who survived because they belonged to a class of patients all of whom die unless operated upon. M. Martens²²⁶ favors ligation of veins in cases of pyemia and quotes the results of his extensive experience with these cases. Martens performs this operation even when metastases are present and he favors the extraperitoneal method. (The operative treatment of puerperal sepsis has never seemed logical to the reviewer. The best results in his opinion are obtained by conservative therapy which comprises rest in bed, forced fluids, glucose, proper nourishment, sunlight, fresh air, and small, repeated, blood transfusions.)

F. Engelmann²²⁷ claims that the results in cases of diffuse puerperal peritonitis can be greatly improved by operation. In a series of 75 such cases he saved 26. J. J. Chydenius²²⁸ found that among 27 patients with generalized postabortal peritonitis who were not operated upon, all but one died. On the other hand, among the 29 on whom

operations were performed 10 recovered. A radical operation with both abdominal and vaginal drainage is recommended. Kriele²²⁹ discusses the early diagnosis and prognosis of pyemia.

A case of ergot poisoning is reported by P. Oginz.²³⁰ The patient had puerperal sepsis and had received 45 ampules of gynergen over a period of fourteen days. T. Antoine²³¹ reports two additional cases of gangrene of the extremities in febrile puerperia after the use of ergot. One patient recovered after amputation of the left leg. The author believes that sepsis with its complications was responsible for the gangrene in these cases and not ergot. (It is extremely rare for ergot to produce gangrene unless enormous amounts of it are given. In most of the reported cases where ergot or gynergen is mentioned as a possible cause, sepsis was present and this condition was more directly responsible for the gangrene than the ergot. Gynergen is an excellent hypodermic preparation of ergot. Undoubtedly Oginz' patient received entirely too much of it.)

THE NEWBORN

Physiology.—In a study of the blood platelets in 100 newborn infants J. Jareho²³² found that in the majority of cases the number varied between 150,000 and 250,000 per c.mm. According to C. R. Corfield,²³³ the best age of expectation for male children is between twenty-four and twenty-five years of age. In order to produce male children, F. Unterberger²³⁴ recommends that the husband powder the prepuce and glans with sodium bicarbonate before having intercourse. In 53 cases where he made this recommendation, boys were born without exception. H. Fütth²³⁵ found a strongly acid secretion in the vaginas of the preponderance of women who gave birth to girls and a weakly acid or amphoteric reaction in most of those who had boys. Hence he believes his findings support Unterberger's contention. (These statements are interesting but require more corroboration before they can be accepted.)

As a result of the sensation created in the newspapers over the supposed mixing of babies in Chicago, an editorial²³⁶ appeared on the method of identifying babies which is used at the St. Louis Maternity Hospital. F. C. Irving²³⁷ describes in detail the method used at The Boston Lying-In Hospital. (A single method for the identification of newborn is always hazardous. At the Chicago Lying-In Hospital we use five different methods for this purpose.)

C. H. Davis and G. W. Stevens²³⁸ believe that a routine radiographic study of all infants might furnish data which would warrant an expense of about two dollars per infant. These authors found enlargement of the thyroid in 32.6 per cent, abnormal lung conditions in 26 per cent, and an abnormal appearance of the heart in 15 per cent.

In 16.4 per cent of 240 cistern punctures of the newborn L. H. Smith²³⁹ found bloody cistern fluids. There was a definite increase of bloody fluids in the cases where the Gwathmey method was employed. The results of this study prove the existence of a "physiologic intracranial damage" incident to labor as pointed out by Ehrenfest. Attention is called by J. R. Goodall²⁴⁰ to the fact that escaping meconium in cases of vertex presentation is not a sign of fetal distress but simply an indication that the child has suffered. The fetal cardiac action judged by its rapidity, slowness or arrhythmia is the only reliable evidence that the fetus is in actual danger. (Quite true.)

J. H. Hess, I. M. Chamberlain and E. C. Lundeen²⁴¹ report a detailed study of 761 premature infants. The most common single cause of prematurity was multiple conception. In 104 autopsies in which special attention was paid to the thymus gland only 5 cases were reported as showing marked hypertrophy. The authors emphasize that when induction of labor is contemplated obstetricians should bear in mind that every additional day of intrauterine life adds much to the infant's opportunity for good physical and mental development. (This article should be read by all obstetricians.)

Complications.—An extensive study of the fetal heart sounds by means of the phenocardiogram has demonstrated to A. S. Hyman²⁴² that the occurrence of cardiac irregularities in uterine life is not an infrequent occurrence. The author differentiates three groups of arrhythmias, only one of which, that probably due to auricular fibrillation, is clinically important.

E. N. Stahnke²⁴³ points out that intrapartum fetal asphyxia may be influenced without undertaking operative procedures in two ways, namely, by administering to the mother an anesthetic such as ether or chloroform or a cardiac stimulant such as digalen.

A study of 806 asphyxiated children in a series of 16,087 labors (4.9 per cent) was made by S. Liebmman.²⁴⁴ The fate of these children was as follows: 604 remained alive, 86 could not be resuscitated, 73 were resuscitated but died within a few hours and 43 died within ten days. Hence the total mortality was 25 per cent. H. L. Kincaid²⁴⁵ recommends the use of a tracheal catheter for the treatment of asphyxia neonatorum whereas D. P. Murphy and J. A. Coyne²⁴⁶ advocate a modified Drinker respirator for the purpose of administering prolonged artificial respiration to asphyxiated children. H. F. Kane and J. Kreiselman²⁴⁷ maintain that the proportion of CO₂ increases with the degree of asphyxia, hence the addition of CO₂ to oxygen as a resuscitating agent is contraindicated. (Practically all asphyxiated babies can be resuscitated by means of a tracheal catheter. Most of those which cannot be revived by this procedure have cerebral hemorrhage. The Drinker respirator and the Kreiselman, Kane, and Swope apparatus are very useful instruments, especially for those who are not adept with the tracheal catheter.)

An anatomical study of 32 cases of subdural hemorrhage leads W. H. Chase²⁴⁸ to the conclusion that this condition is the important intracranial lesion in most cases of birth trauma. The subdural hemorrhage is largely supratentorial and often bilateral. D. Munro²⁴⁹ discusses the symptomatology and immediate treatment of cranial and intracranial injury in the newborn, including intracranial hemorrhage, and F. C. Irving²⁵⁰ takes up the obstetric aspect of intracranial hemorrhage. The latter author states that at the Boston Lying-In Hospital, 40 per cent of 182 fetal autopsies revealed that intracranial hemorrhage was the cause of death. After cesarean section this complication occurred in 0.3 per cent, after spontaneous delivery in 0.4 per cent, after low forceps in 0.5 per cent, after midforceps in 3.0 per cent, after high forceps and breech extraction in 2.6 per cent and after version in 1.7 per cent. J. Partridge²⁵¹ believes that nearly half the infants who are alive at the commencement of labor and are born dead to healthy mothers, die solely because they have sustained intracranial injury at the time of birth.

B. Lundquist²⁵² collected from the literature 3 cases of intrathoracic and 49 cases of intraabdominal hemorrhage in the newborn. The primary etiologic factor was circulatory disturbances in the fetus as a result of labor itself and perhaps also the change in the circulation produced by the first breath of the child. In most of the cases there was an additional biologic factor such as a hemophilic tendency, as evidenced by the fact that 70 per cent of these hemorrhages occurred in male babies.

N. A. Dayton²⁵³ analyzed the psychiatric examinations of 20,473 retarded school children. He found that there appears to be little evidence that abnormal labor occurs to a greater extent in mothers of retarded or mentally defective children than in mothers of the general population. However, there is a definite association between abnormal labor and the dull normal or low normal children. This is important because the bulk of our population lies in these higher levels of intelligence. There was also an association between abnormal labor and neurologic defects. The studies of H. Krukenberg²⁵⁴ prove that birth trauma may result during normal spontaneous labor as well as during operative procedures. This author followed up 72.7 per cent of 1,147 children delivered by forceps. Among 54 delivered by high forceps, one showed permanent injuries, among 144 midforceps cases the incidence was 1.4 per cent and among 739 outlet forceps cases it was only 0.13 per cent. Of 164 children delivered by version and extraction, 5 (3.7 per cent) showed permanent evidence of birth injury. (These two papers should be read by every obstetrician because they contain a good deal of information.)

Although there is experimental evidence to prove that quinine may cause intrauterine death of the child, E. S. Sadler, W. J. Dilling, and A. A. Gemmell²⁵⁵ maintain that statistics show this risk is not greater than that of stillbirths from undiscovered causes in otherwise normal labors. Postmortem examinations on many stillborn children following quinine induction showed intracranial injuries, hence great care is necessary in selecting cases for induction of labor.

An experimental study by D. P. Murphy²⁵⁶ led to no definite conclusion regarding the influence of preconception ovarian irradiation on the development of subsequent offspring in the albino rat. It is significant, however, that no gross structural abnormalities were observed among 493 first and second generation descendants of animals which received preconception ovarian radium irradiation. However, D. P. Murphy and M. De Renyi²⁵⁷ performed experiments with post-conception irradiation and observed deformities among the young of the animals which were irradiated when pregnant and these deformities have not been duplicated in a series of 125,000 nonirradiated control animals. L. Goldstein²⁵⁸ studied the records of 19 microcephalic feeble-minded children irradiated in utero with special reference to ophthalmic defects. Data were available concerning the condition of the eyes in 15 children and in 12 of them there existed serious ophthalmic abnormalities. The author is of the opinion that although defects of the optic apparatus have been observed in nonradiogenic microcephaly, the increased frequency, severity, and uniformity of the changes observed in the radiogenic form point clearly to irradiation as the specific cause. F. L. Adair²⁵⁹ found that malformations occurred in 1.98 per cent of 354 twin pregnancies and in 2.3 per cent of almost

25,000 single pregnancies at the Chicago Lying-In Hospital. Adair analyzes 15 twins with malformations.

THE PLACENTA

F. Curtius²⁶⁰ studied the placentas and also 42 different bodily characteristics of 56 twins to identify identical twins. He concludes that two chorions do not necessarily indicate double ovum twins and conversely single ovum twins are not always monochorionic. Bodily similarity is more important in determining single and double ovum twins than the condition of the membranes. Whether twins will have one or two chorions does not depend alone on whether they originate from one or two ova but more upon the location in which the ova are implanted. (Curtius is not alone in his opinion and there is a good deal of evidence to support it.)

The investigations of A. Hermstein²⁶¹ show that the resistance of fetal membranes is not equal throughout. They are least resistant near their lower pole and their strength increases as the placenta is approached. The amnion is stronger than the chorion. On the other hand the chorion is more impervious to the passage of water because the amnion readily permits the passage of liquor even when it is intact. Bacteria have difficulty traversing the membranes because the chorion is very resistant to them. F. Summervill and V. E. Campbell²⁶² studied the placentas and membranes in 325 consecutive obstetric cases and found evidence of acute inflammation in 16.9 per cent. The incidence was higher in cases with a prolonged second stage of labor and in cases with complications which required operative procedures.

MISCELLANEOUS

It is the belief of H. E. Collier²⁶³ that certain changes in the last twenty years have operated to render the average confinement of today just as dangerous as, if not more dangerous than it was twenty years ago. P. W. Toombs²⁶⁴ maintains that in this country one mother out of every 150 dies in labor or shortly thereafter and furthermore for every patient who succumbs, ten are seriously ill. Toombs discusses the conditions responsible for the mortality and morbidity and also ways of reducing their incidence. The British Ministry of Health appointed a committee to investigate maternal mortality and morbidity and this committee analyzed 2,000 maternal deaths. As a result of this study,²⁶⁵ a number of very important recommendations were made. According to F. Rothbert, Kentucky in 1927 had the next to the lowest maternal mortality among all the States. However, the rate among the colored women was more than twice as high as that for the white women. (This racial difference is one of the facts to be considered by those who maintain the United States has the highest maternal mortality rate among civilized nations. Another fact to be remembered is that some countries make a distinction which was brought out in the British report just mentioned, namely, the separation of deaths into those directly due to pregnancy and childbearing including abortion and ectopic pregnancy and deaths due to an independent concurrent disease. The reports of the United States make no such distinction. Our mortality is no less than it was thirty years ago in spite of the great advances made in medicine and surgery. It is true that we prevent many deaths by proper prenatal care but what

we gain in this way we lose during labor because of the tremendous increase in the number of obstetric operations performed not only by specialists but also by general practitioners.)

J. Ronsheim and I. Daichman²⁶⁶ found the maternal death rate to be 4.5 per thousand in a series of 24,217 deliveries. They emphasize that 88 per cent of all these deaths were preventable. F. L. Adair and M. S. Sichel²⁶⁷ contrast a maternal death rate of 0.51 per cent for 5,911 confinement cases with a rate of 2.04 per cent of 1,272 cases of abortion. Puerperal sepsis was responsible for 43.3 per cent of the labor cases and for 84.6 per cent of the abortion cases.

C. E. Mongan²⁶⁸ takes up the subject of maternal statistics and points out the fallacies of those who constantly tell us that the maternal death rate in the United States is so much worse than it is everywhere else. He emphasizes the fact that although nearly every civilized country is supposed to use the same rules in collecting and compiling vital statistics, there is evidence that it is utterly futile except perhaps in one instance to try to compare the maternal death rates of one country with another. This is due to the unreliable methods and differences in gathering facts. Mongan makes a number of suggestions and emphasizes that it is the duty of the medical profession not unduly to alarm the public with statements based upon uncertain, unreliable, and untrustworthy figures. (This excellent article should be read by every physician and should be reprinted in some lay magazine to counteract the statements made by well-meaning but overenthusiastic and misinformed pseudoreformers.)

Some phases of modern obstetrics are discussed by M. A. Tate,²⁶⁹ and G. W. Kosmak²⁷⁰ writes on sensible standards of proper obstetric care. M. E. Davis²⁷¹ points out the value of motion pictures as an aid in the teaching of obstetrics, and H. Forssner²⁷² takes up the sterilization problem in Scandinavia. Forssner points out that the penal codes of all the Scandinavian countries regard it as a felony to deprive anyone of his or her power of reproduction. The law makes no exception even for medical indications but the courts do not enforce this law against physicians because the purpose of sterilization operations is not to break the law but to help patients.

A. L. Robinson²⁷³ exposes the fallacy of the belief that a woman who has successfully borne several children does not need careful supervision. In a survey of deaths he found that the mortality risk for a woman of forty is three times as great as that of a primipara of eighteen. He points out the complications to which multiparas are especially exposed.

REFERENCES

- (1) Ogino, K.: Zentralbl. f. Gynäk. 54: 464, 1930. (2) Wittenbeck, F.: Arch. f. Gynäk. 142: 446, 1930. (3) Knaus, H.: München. med. Wchnschr. 76: 404, 1929. (4) Hermstein, A.: Arch. f. Gynäk. 141: 76, 1930. (5) Dawson, H. L.: Am. J. Anat. 45: 461, 1930. (6) Vignes, H.: Progrès méd., p. 1329, Aug. 2, 1930. (7) Hanson, S.: AM. J. OBST. & GYNEC. 19: 124, 1930. (8) Matthews, H. B.: Ibid. 20: 612, 1930. (9) Reinberger, J. R., and Schreier, P. C.: Memphis M. J., Jan., 1930. (10) Grier, G. W.: Radiology 14: 571, 1930. (11) Thoms, H.: AM. J. OBST. & GYNEC. 20: 807, 1930. (12) Idem: 19: 539, 1930. (13) Menees, T. O., Miller, J. D., and Holly, L. E.: Am. J. Roentgenol. 24: 363, 1930. (14) Hillis, D. S.: Surg. Gynec. Obst. 51: 852, 1930. (15) Andérodias, J., and Mareille, R.: Rev. franç. de gynéc. et d'obst. 25: 87, 1930. (16) Bercovitz, Z.: AM. J. OBST. & GYNEC. 19: 767, 1930. (17) Monoiloff, E.: Arch. f. Gynäk. 140: 138, 1930. (18) Idem: 142: 474, 1930. (19) Rodcourt, M., and Jernakoff, C.: Zentralbl. f. Gynäk. 54: 2830, 1930. (20)

- Küstner, H.*: Deutsche med. Wehnschr. 56: 384, 1930. (21) *Zondek, B.*: Klin. Wehnschr. 9: 964, 1930. (22) *Robertson, E. M.*: Edinburgh M. J., August, 1930. (23) *Stone, B.*: South. M. J. 23: 747, 1930. (24) *Kreis, J.*: Rev. franç. de gynéc. et d'obst. 25: 199, 1930. (25) *Crow, F. A. E.*: Brit. M. J. 1: 662, 1930. (26) *Parvey, B.*: New England J. M. 203: 1121, 1930. (27) *Allan, H., and Dickens, F.*: Lancet 1: 39, 1930. (28) *Evans, H. M., and Simpson, M. E.*: California & West. Med. 32: 145, 1930. (29) *Wahl, F. A.*: Zentralbl. f. Gynäk. 54: 1288, 1930. (30) *Mack, H. C.*: Surg. Gynec. Obst. 51: 476, 1930. (31) *Liese, G., and Auer, E. S.*: AM. J. OBST. & GYNEC. 20: 667, 1930. (32) *Brouha, L., Hinglais, H., and Simmonet, H.*: Bull. Acad. de méd., Paris 103: 150, 1930. (33) *Kraus, E. J.*: Med. Klin. 26: 1484, 1930. (34) *Aschheim, S.*: Arch. f. Gynäk. 144: 165, 1930. (35) *Ehrhardt, K.*: Zentralbl. f. Gynäk. 54: 2947, 1930. (36) *Stern, A.*: Ibid. 54: 1544, 1930. (37) *Philipp, E.*: Zentralbl. f. Gynäk. 54: 450 and 1858, 1930. (38) *Fels, E.*: Ibid. 54: 2191, 1930. (39) *Bacon, A. R.*: AM. J. OBST. & GYNEC. 19: 352, 1930. (40) *Ehrhardt, K., and Mayes, B. T.*: Zentralbl. f. Gynäk. 54: 2949, 1930. (41) *Hartman, C. G.*: AM. J. OBST. & GYNEC. 19: 405, 1930. (42) *Moore, C. U., Dennis, H. G., and Phillips, R. I.*: Northwest Med. 29: 26, 1930. (43) *Beuthner, B.*: Arch. f. Gynäk. 141: 125, 1930. (44) *Olow, J.*: Acta obst. et gynec. Scandinav. 9: 399, 1930. (45) *Sommer, K., and Ziegeler, H.*: Ztschr. f. Geburtsh. u. Gynäk. 97: 282, 1930. (46) *Reichelt, H.*: Monatschr. f. Geburtsh. u. Gynäk. 84: 357, 1930. (47) *Bollag, K.*: Zentralbl. f. Gynäk. 54: 1867, 1930. (48) *Reid, W. D.*: AM. J. OBST. & GYNEC. 19: 63, 1930. (49) *Idem*: J. A. M. A. 95: 1468, 1930. (50) *Herrmann, G., and King, E. L.*: J. A. M. A. 95: 1472, 1930. (51) *Daly, P. A.*: Illinois M. J. 57: 205, 1930. (52) *Meyer, J., Lackner, J. E., and Schochet, S. S.*: J. A. M. A. 94: 1901, 1930. (53) *Reycraft, J. L.*: Ohio State M. J. 26: 759, 1930. (54) *Clute, H. M., and Daniels, D. H.*: Am. J. Med. Sc. 179: 477, 1930. (55) *Hinton, J. W.*: AM. J. OBST. & GYNEC. 20: 183, 1930. (56) *Hartley, E. C.*: Ibid. 19: 54, 1930. (57) *Nevinny, H., and Schretter, G.*: Arch. f. Gynäk. 140: 397, 1930. (58) *Bowcock, H., and McCord, J. R.*: J. A. M. A. 94: 1917, 1930. (59) *Vignes, H.*: Gaz. méd. de France No. 3, 65, 1930. (60) *Williamson, A. C.*: AM. J. OBST. & GYNEC. 20: 192, 1930. (61) *Barnes, H. L., and Barnes, L. R. P.*: Ibid. 19: 490, 1930. (62) *Matthews, H. B., and Bryant, L. S.*: J. A. M. A. 95: 1707, 1930. (63) *Bland, P. B., Goldstein, L., and First, A.*: Am. J. Med. Sc. 179: 48, 1930. (64) *Idem*: Surg. Gynec. Obst. 50: 954, 1930. (65) *Idem*: AM. J. OBST. & GYNEC. 20: 70, 1930. (66) *Moore, J. H.*: Ibid. 20: 254, 1930. (67) *Nalle, B. C.*: South. M. J. 23: 490, 1930. (68) *Suwa, Y.*: Jap. J. Obst. & Gynec. 13: 73 and 79, 1930. (69) *Heim, K.*: Zentralbl. f. Gynäk. 54: 1026, 1930. (70) *Peterson, R., Field, H., and Morgan, H. S.*: J. A. M. A. 94: 839, 1930. (71) *McCord, J. R.*: South. M. J. 23: 40, 1930. (72) *Wile, U. J., and Shaw, J. W.*: J. A. M. A. 95: 1791, 1930. (73) *Aschheim, S.*: AM. J. OBST. & GYNEC. 19: 335, 1930. (74) *Mack, H. E., and Catherwood, A. E.*: Ibid. 20: 670, 1930. (75) *Schultz-Rhnhof, F.*: Zentralbl. f. Gynäk. 54: 578, 1930. (76) *Haupt, W.*: Zentralbl. f. Gynäk. 54: 2260, 1930. (77) *Ehrhardt, K.*: Ibid. 54: 1538, 1930. (78) *Fahlbusch, O.*: Ibid. 54: 1512, 1930. (79) *Zondek, B.*: Ibid. 54: 2306, 1930. (80) *Novak, E., and Koff, A. K.*: AM. J. OBST. & GYNEC. 20: 153, 1930. (81) *Idem*: 20: 481, 1930. (82) *Schmitz, H., and Hueper, W.*: J. A. M. A. 95: 1413, 1930. (83) *Szathmary, Z. v.*: Ztschr. f. Geburtsh. u. Gynäk. 98: 444, 1930. (84) *Gustafson, G. W.*: J. Indiana State Med. Assn., February, 1930. (85) *Wilson, L. A.*: 95: 1093, 1930. (86) *Bland, P. B., and Goldstein, L.*: Ibid. 95: 473, 1930. (87) *Greenhill, J. P.*: Illinois M. J. 57: 272, 1930. (88) *Frey, H., and Herrmann, E.*: Wien. klin. Wehnschr. 43: 545, 1930. (89) *Cabanes, P. A.*: Bull. Soc. d'obst. et de gynéc. 6: 420, 1930. (90) *Caffier, P.*: Zentralbl. f. Gynäk. 54: 723, 1930. (91) *Hofbauer, J.*: Ibid. 54: 1638, 1930. (92) *Saenger, H.*: Arch. f. Gynäk. 142: 152, 1930. (93) *Theobald, G. W.*: Lancet 1: 1030, 1930. (94) *Idem*: 1: 1115, 1930. (95) *Macht, D. I., and Losec, J. R.*: Bull. Johns Hopkins Hosp. 46: 217, 1930. (96) *King, E. L.*: South. M. J. 23: 285, 1930. (97) *Stander, H. J., Eastman, N. J., and Harrison, E. P. H.*: AM. J. OBST. & GYNEC. 19: 26, 1930. (98) *Eastman, N. J.*: AM. J. OBST. & GYNEC. 19: 343, 1930. (99) *Stander, H. J., and Eastman, N. J.*: Ibid. 20: 822, 1930. (100) *Titus, P., Willetts, E. W., and Lightbody, H. D.*: Ibid. 19: 16, 1930. (101) *Dorsett, L.*: J. Missouri M. A. 27: 316, 1930. (102) *Dorsett, L., and Schwartz, O. H.*: South. M. J. 23: 288, 1930. (103) *McConnel, W. T.*: Am. J. Surg. 8: 1263, 1930. (104) *Reycraft, J. L.*: AM. J. OBST. & GYNEC. 19: 786, 1930. (105) *Moore, J. H.*: Ibid. 19: 544, 1930. (106) *Harding, V. J.,*

- and Van Wyck, H. B.: Brit. M. J. 2: 589, 1930. (107) Seitz, L.: Arch. f. Gynäk. 142: 52, 1930. (108) Davis, M. E.: J. Arkansas M. Soc. 27: 19, 1930. (109) Klein, W. O.: Arch. f. Gynäk. 139: 413, 1930. (110) Upshaw, C. B.: South. M. J. 23: 388, 1930. (111) Reinberger, J. R., and Schreier, P. C.: J. Tennessee M. A. 23: 252, 1930. (112) Thulin, E.: Acta obst. et gynec. Scandinav. 9: 554, 1930. (113) Gylleusvard, N.: Ibid. 9: 221, 1930. (114) Rissman, P.: Med. Klin. 26: 383, 1930. (115) Stroganoff, B.: Gynec. et Obst. 22: 385, 1930. (116) Llamas-Massini, J. C.: Ibid. 22: 404, 1930. (117) Johnson, H. W., and Johnston, R. A.: South. M. J. 23: 390, 1930. (118) Kobes, R.: Zentralbl. f. Gynäk. 54: 666, 1930. (119) Berman, S.: New England J. Med. 203: 361, 1930. (120) Browne, F. J., and Dodds, G. H.: J. Obst. & Gynec. Brit. Emp. 37: 476, 1930. (121) Greenhill, J. P.: J. A. M. A. 87: 228, 1926. (122) Perez, M. L.: Zentralbl. f. Gynäk. 54: 1937, 1930. (123) Rudolph, L., and Ivy, A. C.: AM. J. OBST. & GYNEC. 19: 317, 1930. (124) Mayes, H. W., and Ullian, S.: Surg. Gynec. Obst. 51: 345, 1930. (125) Laferty, J. M.: AM. J. OBST. & GYNEC. 19: 647, 1930. (126) Norris, C. C.: AM. J. OBST. & GYNEC. 19: 500, 1930. (127) Mitchell, D. A.: Brit. M. J. 1: 144, 1930. (128) Rongy, A. J.: M. J. & Rec. 131: 420 and 451, 1930. (129) Calkins, L. A., Irvine, J. H., and Horsley, G. W.: AM. J. OBST. & GYNEC. 19: 294, 1930. (130) Temesvary, N.: Ibid. 19: 267, 1930. (131) Davis, M.: New England J. Med. 203: 771, 1930. (132) Jarcho, J.: AM. J. OBST. & GYNEC. 19: 81, 1930. (133) Holtz, F.: Gynecologie 29: 153, 1930. (134) Diasio, J. S.: M. J. & Rec. 132: 399, 1930. (135) Haynes, L. W.: J. Michigan M. Soc. 29: 158, 1930. (136) Pachner, F.: Zentralbl. f. Gynäk. 54: 121, 1930. (137) Kaiser, K.: Ibid. 54: 599, 1930. (138) Puppel, E.: Ibid. 54: 1878, 1930. (139) Graff, E.: Ibid. 54: 2961, 1930. (140) Schoeneck, H. W., and Schoeneck, F. J.: AM. J. OBST. & GYNEC. 20: 658, 1930. (141) Rucker, M. P.: Ibid. 20: 791, 1930. (142) Mahon, R.: Rev. franç. de gynéc. et d'obst. 25: 165, 1930. (143) Gwathmey, J. T.: Surg. Gynec. Obst. 51: 190, 1930. (144) Harper, P. T.: New York State J. Med. 30: 86, 1930. (145) McCormick, C. O.: AM. J. OBST. & GYNEC. 20: 411, 1930. (146) Fist, H. S.: California & West. Med. 32: 331, 1930. (147) Reed, C. B.: Am. J. Surg. 9: 76, 1930. (148) Naujoks, H.: Monatschr. f. Geburtsh. u. Gynäk. 84: 97, 1930. (149) Connell, J. S. M.: Lancet 2: 184, 1930. (150) J. A. M. A. 95: 1427, 1930. (151) Putz, J.: Zentralbl. f. Gynäk. 54: 348, 1930. (152) Goldschmidt, H.: Ibid. 54: 344, 1930. (153) Swendon, J. J.: Minnesota Med. 13: 855, 1930. (154) Bourne, A. W., and Burn, J. H.: Brit. M. J. 2: 87, 1930. (155) Gremme, A.: Zentralbl. f. Gynäk. 54: 1550, 1930. (156) Torland, T.: Northwest Med. 29: 312, 1930. (157) Heim, K.: Monatschr. f. Geburtsh. u. Gynäk. 84: 45, 1930. (158) Bailey, W. M.: Texas State J. Med. 26: 244, 1930. (159) Featherstone, H. W.: Canad. M. A. J. 23: 505; and Brit. M. J. 2: 676, 1930. (160) Burns, J. W.: Lancet 1: 1012, 1930. (161) Wislanski, K.: Zentralbl. f. Gynäk. 54: 2330, 1930. (162) Plass, E. D.: J. A. M. A. 94: 255, 1930. (163) Potter, I. W.: AM. J. OBST. & GYNEC. 19: 289, 1930. (164) Sachs, H.: Zentralbl. f. Gynäk. 54: 1180, 1930. (165) v. Probstner, A.: Med. Klin. 26: 1735, 1930. (166) Waren, E.: Acta obst. et gynec. Scandinav. 9: 623, 1930. (167) Greenhill, J. P.: Memphis M. J. July, 1930. (168) Miller, D.: Brit. M. J. 1: 1036, 1930. (169) Pieri, R. J.: Surg. Gynec. Obst. 50: 1032, 1930. (170) Vaux, N. W.: AM. J. OBST. & GYNEC. 20: 782, 1930. (171) Wilson, K. M.: New York State J. Med. 30: 389, 1930. (172) Meeker, S.: Memphis M. J. 7: 102, 1930. (173) Henriët, P.: Bull. Soc. d'obst. et de gynéc. 4: 309, 1930. (174) Gounet: Ibid. 2: 124, 1930. (175) v. Ammon, E.: Arch. f. Gynäk. 140: 66, 1930. (176) Thompson, W. B.: AM. J. OBST. & GYNEC. 19: 392, 1930. (177) Ilkewitz, W., Lewi, M., and Selitzky, S.: Arch. f. Gynäk. 142: 389, 1930. (178) Greenhill, J. P.: AM. J. OBST. & GYNEC. 19: 613, 1930. (179) Danforth, W. C., and Grier, R. M.: Ibid. 20: 405, 1930. (180) Hasselblatt, R.: Acta obst. et gynec. Scandinav. 10: supplement, 1930. (181) Steele, K. B.: AM. J. OBST. & GYNEC. 19: 747, 1930. (182) Nürnberger, L.: Arch. f. Gynäk. 142: 106, 1930. (183) Burns, H. T.: AM. J. OBST. & GYNEC. 19: 759, 1930. (184) Kumamoto, T., and Nakayama, S.: Jap. J. Obst. & Gynec. 13: 179, 1930. (185) Pokrowsky, W., and Rabinowitsch, J.: Arch. f. Gynäk. 141: 404, 1930. (186) Greenhill, J. P., and Bloom, B.: J. A. M. A. 92: 21, 1929. (187) Kropp, L.: Ztschr. f. Geburtsh. u. Gynäk. 198: 469, 1930. (188) Rouver, B. J.: Gynec. et obst. 20: 591, 1930. (189) McLane, C. M.: AM. J. OBST. & GYNEC. 20: 650, 1930. (190) Scheyer, E.: Zentralbl. f. Gynäk. 54: 1505, 1930. (191) Martin, E.: Monatschr. f. Geburtsh. u. Gynäk. 85: 255, 1930. (192) Meyer, K.: Arch. f. Gynäk. 142: 226, 1930. (193) Skajaa, K.: Acta obst. et gynec. Scandinav. 9: 453, 1930. (194) Balard, P.: Bull. Soc. d'obst. et de gynéc.

- 5: 362, 1930. (195) *Greenhill, J. P.*: Surg. Gynec. Obst. 50: 113, 1930. (196) *Kessler, R.*: Monatschr. f. Geburtsh. u. Gynäk. 86: 175, 1930. (197) *Balaré, P.*: Rev. franç. de gynéc. et d'obst. 25: 110, 1930. (198) *Puppel, E.*: Monatschr. f. Geburtsh. u. Gynäk. 85: 246, 1930. (199) *Kellogg, F. S.*: AM. J. OBST. & GYNEC. 20: 643, 1930. (200) *v. Ammon, E.*: Ztschr. f. Geburtsh. u. Gynäk. 97: 261, 1930. (201) *Vogt, E.*: Zentralbl. f. Gynäk. 54: 1042, 1930. (202) *Kauter, A. E., and Klawans, A. H.*: Illinois M. J. 58: 285, 1930. (203) *Küstner, H., and Börner, R.*: Monatschr. f. Geburtsh. u. Gynäk. 84: 275, 1930. (204) *Wileus, I.*: J. A. M. A. 94: 259, 1930. (205) *Macht, D. I., and Leach, H.*: Bull. Johns Hopkins Hosp. 46: 225, 1930. (206) *Bland, P. B., Goldstein, L., and First, A.*: Surg. Gynec. Obst. 50: 1429, 1930. (207) *Idem.*: AM. J. OBST. & GYNEC. 20: 165, 1930. (208) *Baldwin, L. G.*: Ibid. 19: 93, 1930. (209) *Müller, H. A., Martinez, D. B., and Hodgson, M. E.*: J. A. M. A. 95: 923, 1930. (210) *Taylor, J., and Wright, H. D.*: J. Obst. & Gynec. Brit. Emp. 37: 213, 1930. (211) *Colebrook, L., and Hare, R.*: Brit. M. J. 1: 241, 1930. (212) *Rankin, A. L. K.*: Lancet 2: 188, 1930. (213) *Brown, T. K.*: AM. J. OBST. & GYNEC. 20: 300, 1930. (214) *Colebrook, L.*: Brit. M. J. 2: 134, 1930. (215) *Lash, A. F.*: AM. J. OBST. & GYNEC. 20: 348, 1930. (216) *Gundel, M., and v. Oettingen, K.*: Zentralbl. f. Gynäk. 54: 327, 1930. (217) *Kobak, A. J.*: AM. J. OBST. & GYNEC. 19: 299, 1930. (218) *Dafoe, W. A.*: Ibid. 20: 174, 1930. (219) *Burt-White, H., Colebrook, L., Morgan, G., Jervis, J. W., and Harre, E.*: Brit. M. J. 1: 240, 1930. (220) *Stent, L.*: Lancet 1: 1066, 1930. (221) *Burt-White, H.*: Ibid. 1: 16, 1930. (222) *King, W. W.*: Brit. M. J. 1: 533, 1930. (223) *Murray, E. F.*: Ibid. 2: 514, 1930. (224) *Meyer, J. A.*: AM. J. OBST. & GYNEC. 20: 760, 1930. (225) *Baldwin, J. F.*: Ibid. 19: 219, 1930. (226) *Martens, M.*: Ztschr. f. Geburtsh. u. Gynäk. 99: 1, 1930. (227) *Engelmann, F.*: Zentralbl. f. Gynäk. 54: 972, 1930. (228) *Chydenius, J. J.*: Acta obst. et gynec. Scandinav. 10: 1, 1930. (229) *Kriele*: Ztschr. f. Geburtsh. u. Gynäk. 99: 35, 1930. (230) *Oginz, P.*: AM. J. OBST. & GYNEC. 19: 657, 1930. (231) *Antoine, T.*: Arch. f. Gynäk. 139: 492, 1930. (232) *Jarcho, J.*: Arch. Pediat. 47: 230, 1930. (233) *Corfield, C. R.*: Lancet 1: 803, 1930. (234) *Unterberger, F.*: Deutsche med. Wchnschr. 56: 304, 1930. (235) *Füth, H.*: München. med. Wchnschr. 77: 1994, 1930. (236) *Editorial*: J. Missouri M. A. Sept., 1930. (237) *Irving, F. C.*: AM. J. OBST. & GYNEC. 20: 105, 1930. (238) *Davis, C. H., and Stevens, G. W.*: AM. J. OBST. & GYNEC. 20: 73, 1930. (239) *Smith, L. H.*: Ibid. 19: 374, 1930. (240) *Goodall, J. R.*: Canad. M. A. J. 22: 246, 1930. (241) *Hess, J. H., Chamberlain, I. M., and Lundeen, E. C.*: Pennsylvania M. J. 33: 429, 1930. (242) *Hyman, A. S.*: AM. J. OBST. & GYNEC. 20: 332, 1930. (243) *Stahnke, E. N.*: Zentralbl. f. Gynäk. 54: 1799, 1930. (244) *Liebmann, S.*: Arch. f. Gynäk. 139: 544, 1930. (245) *Kincaid, H. L.*: Texas State J. Med. 25: 750, 1930. (246) *Murphy, D. P., and Coyne, J. A.*: J. A. M. A. 95: 335, 1930. (247) *Kane, H. F., and Kreiselman, J.*: AM. J. OBST. & GYNEC. 20: 826, 1930. (248) *Chase, W. H.*: Surg. Gynec. Obst. 51: 31, 1930. (249) *Munro, D.*: New England J. Med. 203: 502, 1930. (250) *Irving, F. C.*: Ibid. 203: 499, 1930. (251) *Partridge, J.*: J. Obst. & Gynec. Brit. Emp. 37: 1, 1930. (252) *Lundquist, B.*: Acta obst. et gynec. Scandinav. 9: 331, 1930. (253) *Dayton, N. A.*: New England J. Med. 203: 398, 1930. (254) *Krukenberg, H.*: Zentralbl. f. Gynäk. 54: 1802, 1930. (255) *Sadler, E. S., Dilling, W. J., and Gemmell, A. A.*: J. Obst. & Gynec. Brit. Emp. 37: 529, 1930. (256) *Murphy, D. P.*: Surg. Gynec. Obst. 50: 588, 1930. (257) *Murphy, D. P., and de Renyi, M.*: Ibid. 50: 861, 1930. (258) *Goldstein, L.*: Arch. Neurol. & Psychiat. 24: 102, 1930. (259) *Adair, F. L.*: AM. J. OBST. & GYNEC. 20: 539, 1930. (260) *Curtius, F.*: Arch. f. Gynäk. 140: 361, 1930. (261) *Hermstein, A.*: Ztschr. f. Geburtsh. u. Gynäk. 97: 199, 1930. (262) *Summervill, F., and Campbell, F. E.*: Colorado Med. 27: 197, 1930. (263) *Collier, H. E.*: J. Obst. & Gynec. Brit. Emp. 37: 27, 1930. (264) *Toombs, P. W.*: South. M. J. 23: 135, 1930. (265) *J. A. M. A. Sept. 13, 1930, London letter.* (266) *Ronsheim, J., and Daichman, I.*: AM. J. OBST. & GYNEC. 20: 816, 1930. (267) *Adair, F. L., and Sichel, M. S.*: Northwest Med. 29: 450, 1930. (268) *Mongan, C. E.*: Illinois M. J. 57: 323, 1930. (269) *Tate, M. A.*: Ohio State M. J. 26: 30, 1930. (270) *Kosmak, G. W.*: J. Med. Soc. New Jersey 27: 328, 1930. (271) *Davis, M. E.*: Mod. Hosp. 35: 99, 1930. (272) *Forssner, H.*: Acta obst. et gynec. Scandinav. 9: 150, 1930. (273) *Robinson, A. L.*: Brit. M. J. 2: 47, 1930.

Selected Abstracts

Sterility

Meaker, S. R.: The Fundamental Nature of Relative Sterility. New England J. Med. 201: 160, 1929.

In practically every case the cause of sterility is a sum-total of multiple factors, rather exceptionally it is a single abnormality. Responsibility is to some extent divided between the male and the female in at least 90 per cent of cases. Intelligent management of sterility, therefore, requires in every case a complete study of both partners, dealing with constitutional as well as local conditions.

EHRENFEST.

Meaker, Samuel R., and Glaser, William: The Hydrogen-Ion Concentration of the Endocervical Secretions. Surg. Gynec. Obst. 48: 73, 1929.

The vaginal reaction is ordinarily unimportant in relation to fertility and sterility. It is not always negligible, however, for in occasional cases an excessive vaginal acidity may cause sterility.

The cervical reaction is constantly and definitely alkaline, ranging from P_H 8.0 to P_H 9.0 and being above P_H 8.5 in about 80 per cent of cases.

The cervical reaction is not notably influenced by age, parity, the menstrual cycle, endocervicitis, or viscosity of the endocervical mucus. In pelvic hypoplasia it may possibly be less alkaline than in normally developed cases.

WM. C. HENSKE.

Rio, Luigi: The Vitamin E of Fertility. Influence of the Absence of Vitamin E on the Internal Genitalia and on the Endocrine System. Arch. di ostet. e. ginec. 16: 711, 1929.

Rats of both sexes under a basal diet lacking in vitamin E, became sterile. Histologic examination made on every organ, shows modification only on the sexual glands, on the endocrine glands and on the uterus.

Both in the testicles and in the ovaries an extensive degeneration of the germinal epithelium is found; in the endometrium signs of atrophy are seen, and in the endocrine glands hypertrophy and hyperplasia are observed.

Such alterations do not happen in animals whose diet is supplemented with one or two drops of oil of wheat, bearer of a vitamin which is specific for the sexual function.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Holtz, F.: The Frequency of Pregnancy in Women Who Have Had Salpingo-oophoritis. Acta obst. et gynec. Scandinav. 8: 88, 1929.

It is generally believed that pregnancy is rare among women who have had salpingo-oophoritis. Holtz studied a series of 1306 cases of this disease in which sepsis was responsible for 102, gonorrhea for 402, tuberculosis for 44, while in 748 cases no definite cause could be found. Ninety per cent of the patients were fol-

lowed up and it was found that 137 out of 807 or 17 per cent who were not operated upon conceived. The incidence of pregnancy for the married women in the septic group was 31.2 per cent, for the gonorrheal group it was 22.8 per cent and for those with unknown etiology it was 25.4 per cent. For the whole group there was a total of 127 deliveries and 35 abortions. The frequency of pregnancy was lower in the cases where large masses were palpable. Of 48 women in whom the adnexa were removed on only one side, 13 or 29.5 per cent later became pregnant. Of the married women 42.3 per cent later conceived.

The author concludes that contrary to the common belief, conception is not rare after salpingo-oophoritis and sterility does not always follow gonorrheal salpingitis even where large masses are present.

J. P. GREENHILL.

Katz, H.: *Infantilism and Sterility*. Wien. klin. Wchnschr. 42: 1030, 1929.

Genital infantilism is found in 3.5 per cent to 5 per cent of women and is one of the main causes of sterility. The entire genital tract including the breasts may be hypoplastic or only one or several parts of the tract involved. One finds a prominent mons pubis, funnel-shaped contracted vulva, perineum extending a considerable distance downward, short and narrow rigid vagina with markedly developed mucous membrane, small cylindrical or long conically pointed portio vaginalis, uterine displacements, and disproportion between uterine body and cervix, all as signs of hypoplasia. The cervix especially shows marked changes. It is long, rigid, and narrow, and a markedly viscid gelatinous plug almost hermetically seals the external os making it impossible for the spermatozoa to get through. Functional abnormalities may also contribute to cause sterility in these cases as an irregular or too infrequent ovulation, although its importance has not yet been determined. Hypoplasia of the tubes may be another cause.

Treatment is directed toward building up the underdeveloped tissues. Change of climate and general hygienic measures; heat locally in the form of hot air, diathermy, hot packs, and sun baths; coitus correctly carried out and at regular intervals; hormone therapy by mouth or, in severe cases, ovarian implantation; operative procedures such as dilatation of the os and abrasion of the mucous membrane, are recommended. Ensuing gravidity may end in abortion, but often stimulates development of the uterus to normal so that later pregnancies may be carried to term.

FRANK SPIELMAN.

Macomber, Donald, and Sanders, Morris B.: *The Spermatozoa Count*. New England J. Med. 200: 981, 1929.

The authors counted spermatozoa in the usual counting chamber, using as diluent a solution of 5 per cent sodium bicarbonate to which one per cent of formalin has been added.

In trying to establish what amounts to a normal count they found that the largest number of cases would show about 100 million spermatozoa per c.c. Investigations in regard to total number in ejaculation lead them to the conclusion that this figure seemingly is of less significance in relation to fertility than the concentration. This concentration apparently increases with advancing age, beginning to decline gradually in the decade between forty and forty-nine years. There exists a direct relation between size of testis and volume of semen. In the large majority of spermatozoa the head lengths were relatively uniform. In sperms of low concentration there was markedly more variation in head lengths. Spermatozoa count gives identical information as to fertility as does head length measurements, the

former representing the by far simpler method. Pregnancy is not impossible with counts as low as 60 million but the chances probably are slight without further increase by treatment (prostatic massage). Spermatozoa count has been of value not only in the diagnosis of fertility but also in gauging the effect of treatment, that is, as well in prognosis.

EHRENFEST.

Graff, E.: *Diagnosis and Treatment of Sterility*. Wien. klin. Wchnschr. 42: 1378, 1929.

It was found that in only 10 per cent of 200 sterility cases studied was the male at fault. In the female the causes for sterility fall into 3 groups: hypoplasia, infection, and position changes. The frequent association of hypoplasia and infection, as occurred in one-third of the cases, is an indication of the susceptibility of hypoplastic organs, making operative procedures inadvisable.

The importance of the Rubin test both in diagnosis and treatment is stressed. Of 43 cases, 14 or 32.6 per cent became pregnant immediately following the procedure. Intercourse within twenty-four hours is recommended. Repeated insufflations, however, have not been productive of results, and as there is danger of infection are to be avoided. Dilatation and curettage although sometimes efficacious in isolated cases are to be employed only occasionally. Posterior discission can be done where there is retroversion of a hypoplastic uterus, preventing contact between sperma and external os. In general, abnormal versions and flexions should be corrected. Results of plastics on closed tubes have been most gratifying where the closure was at the interstitial portion. For hypoplasia the usual hydro- and physiotherapeutic measures as well as glandular extracts are recommended.

FRANK SPIELMAN.

Giles, Arthur E.: *The Diagnosis and Treatment of Sterility*. Brit. M. J. 2: 647, 1928.

The author limits his subject to sterility of the woman.

Correct diagnosis of female sterility depends on a thorough and systematic investigation of anatomic features that affect transit of spermatozoa from the vagina to the fallopian tube, possibility of fertilization of the ovum, and transfer of the fertilized ovum from ovary to uterus.

Often an undersized uterus associated with infrequent scanty menstruation may represent a delayed, not an arrested, development and in such a case stimulus of marriage offers most successful treatment.

Pronounced obesity seems to be antagonistic to reproductive activity; it is a matter of clinical experience that fat sterile women become fertile when fat has been reduced.

To obviate difficulty in intercourse, a rigid hymen must be incised and a narrowed vaginal orifice dilated under general anesthesia, or enlarged by plastic operation.

For unduly contracted os, cervical canal is dilated. For marked ante flexion of cervix, he advises moderate dilation of cervical canal and introduction of a glass intrauterine stem pessary which is left for ten to twelve days, during which time patient must stay in bed. Retroversion or retroflexion are corrected and a Hodge pessary used if necessary.

Noxious discharges are properly treated.

For tubal obstruction surgical measures are necessary.

Basal metabolism must be done and blood morphology studied on both husband and wife.

ADAIR-CURRAN.

Walker, Kenneth: *Diagnosis and Treatment of Sterility in the Male*. Brit. M. J. 2: 652, 1928.

Out of 57 men referred to the author by gynecologists only 25 were considered absolutely normal. Of the 32 deficient ones, 18 were absolutely sterile, 6 showed marked impairment of fertility and 8 minor degrees. Examination of semen of these 57 cases showed: normal healthy semen in 25; oligospermia in 2; oligozoospermia in 6; oligonecrozoospermia in 6, and azoospermia in 18.

Various conditions affecting output of spermatozoa from tubules are: infections—orchitis, epididymitis and infections elsewhere in body; endocrine disturbances; absence of special vitamin E; and bilateral retained testicles.

The method of artificial insemination in treating sterility has been successful in the hands of veterinary surgeons but not of gynecologists. This may be explained by differences in technique. In veterinary practice, insemination is preceded by sexual stimulation. In human beings, patients are often inseminated while under anesthesia, with no preliminary stimulation, no outpouring from accessory sexual glands.

Surgery is of little help for correction of stenosis, whether in epididymis or ejaculatory ducts.

Endocrine therapy may help in cases of aspermatogenesis. Anterior lobe pituitary extracts should be used for six months. In cases of hypothyroidism thyroid extract is administered.

ADAIR-CURRAN.

Willbrand, L.: *The Results of Tubal Insufflation in Sterility*. Monatschr. f. Geburtsh. u. Gynäk. 84: 63, 1930.

In a series of 406 cases of sterility, Willbrand found that 271 were primary and 135 secondary cases of sterility. The tubes were closed in 17 per cent of the primary cases and in 14 per cent of the secondary ones. The chief cause of sterility in the primary group was hypoplasia and this was found in 38 per cent. Inflammatory changes were detected in only 14.3 per cent.

In the cases of secondary sterility the cause was a previous inflammation in 24.4 per cent, of which 30.7 per cent had their origin in puerperal infection.

Tubal insufflation gives more information in sterility than any other test. The author never saw any serious complications following this procedure. Pregnancy followed tubal insufflation in 21 per cent of the primary sterility cases, and in 30 per cent of the secondary sterility cases. The curettement which was performed at the same time helped considerably.

J. P. GREENHILL.

Mayer, A.: *Treatment of Sterility by Tubal Insufflation*. München. med. Wehnschr. 39: 1627, 1929.

Mayer reports his results in 406 cases of sterility treated by insufflation of gas. He emphasizes the usual precautions in the selection of cases. In doing the test, he limits the pressure to 150 mm. of mercury. Of the 271 cases of primary sterility, 17 per cent were nonpatent, and 21 per cent subsequently conceived. Of the 135 cases of secondary sterility, 14 per cent were nonpatent, and 30 per cent subsequently conceived. Among these, 48 per cent of the cases of secondary sterility after a previous abortion became pregnant. Mayer feels that, in addition to the establishment of patency by the gas, the test has a favorable effect which is due to the unavoidable abrasion of the mucosa. This, in some way, seems to favor conception, either by stimulating the growth of the uterus or favoring the nidation of the ovum. He cites as support of this assumption the fact that 27

per cent of 103 cases of uterine hypoplasia conceived after this test, while the general average in the whole group was 21 per cent.

The author feels that tubal insufflation is of value, primarily, as a diagnostic measure; that the establishment of tubal patency is but one of the many factors concerned in the study of sterility; and that a successful test by no means ensures subsequent pregnancy.

A. SHULMAN.

Vignes, H.: Artificial Fecundation. *Progrès méd.* 44: 1646, 1929.

The author gives a thorough analysis of this subject. He points out the preliminary precautions necessary before insemination is undertaken and indicates that the proper time in the menstrual cycle for this is as near the period of ovulation as possible. Insemination must be repeated frequently to obtain good results. There are four methods of collecting the sperm, namely, masturbation into a sterile glass, coitus interruptus, coitus condomatus, and natural coitus followed by aspiration from the vagina. The sperm should be injected undiluted beyond the internal os into the uterine cavity. The technic is described in detail by the author and he also takes up the male and female indications and also the contraindications for the procedure. He quotes the results obtained by various authors.

J. P. GREENHILL.

Kakuschkin, N.: Transplantation of the Fallopian Tubes From One Woman to Another. *Monatschr. f. Geburtsh. u. Gynäk.* 85: 19, 1930.

The author has transplanted the fallopian tubes from one woman to another in five instances. Each tube was removed with the entire uterine horn and with the corresponding ovary. Likewise, in the recipient, the diseased tube with the uterine horn was cut away. In the cases where no tube was present at the time of operation, the mesosalpinx and infundibulo-pelvic ligament were freshened. To obtain fresh specimens the operations on both the donor and the recipient were performed simultaneously on two adjoining tables. Only the large blood vessels were ligated. The postoperative convalescence was not without complications.

J. P. GREENHILL.

Nishizaki: Tubal Sterilization Through the Uterine Cavity. *Japanese J. Obst. & Gynec.* 12: 285, 1929.

The author used his electrocoagulation apparatus in 14 uteri of which 12 had been removed from multiparas. He maintains that only superficial cauterization is accomplished on the tubal opening by Dickinson's electric cautery method of sterilization. Nishizaki, however, attempts to produce complete obstruction of the tubal opening with his own apparatus which extends for a depth of 7 mm. into the intramural segment of the tube.

J. P. GREENHILL.

Forssner: The Sterilization Problem in Scandinavia. *Acta obst. et gynec. Scandinav.* 9: 150, 1930.

The penal codes of all the Scandinavian countries regard it as a felony to deprive anyone of his or her power of reproduction. The law makes no exceptions even for operations performed by physicians for medical indications. The courts however, do not enforce this law against the medical profession. In spite of this fact physicians and lawyers believe that a special law is advisable because it is doubtful whether the existing law will be interpreted in the same way for steriliza-

tion operations done for social-medical reasons. The author sees no necessity for such a new law and mentions that he has performed 37 sterilization operations during the last three years. He believes the existing laws under the protection of an enlightened judiciary body are satisfactory.

J. P. GREENHILL.

Corrections

In Dr. Ehrenfest's White House Conference report, "Factors and Causes of Fetal, Newly Born, and Maternal Morbidity and Mortality," in the June number, page 868, line 9 from the top, reads: The Children's Bureau estimates that of all abortions in this country 50 per cent are criminally induced, 37 per cent spontaneous, and the remaining 13 per cent therapeutic.

This statement is not quite correct since these percentages do not pertain to *all* abortions but only to abortions which in this study of the Children's Bureau have been found to precede puerperal deaths.

In the April issue of the JOURNAL, on page 554, there is presented a quotation by Dr. W. F. Nelms in an article on placenta previa as follows: "Douglass and Siegel report 14 cesarean sections in their series, with no maternal mortality, but their fetal mortality was 90 per cent." This quotation is correct except for the fetal mortality, which was only 7.14 per cent.

In the article by Stein, Eight Years' Experience With Roentgen Diagnosis in Gynecology, which appeared on page 671, May, 1931, issue, Figs. 3-A and 4 appeared upside down.

Dr. John Osborn Polak

While going to press the distressing news reaches us of the unexpected death of Dr. John Osborn Polak, of Brooklyn, N. Y., a valued member of the Editorial Board of this JOURNAL since its existence.

The Editors.





John Osborn Polak
1870-1931

American Journal of Obstetrics and Gynecology

VOL. XXII

ST. LOUIS, AUGUST, 1931

NO. 2

IN MEMORIAM

JOHN OSBORN POLAK

MARCH 12, 1870-JUNE 29, 1931

WITH the death of John Osborn Polak on June 29, there passed an outstanding physician, teacher and citizen. He died as he had wished, "on the job"—suddenly, without apparent warning and without bodily pain. He was at the height of his very active and useful career, never more enthusiastic and hopeful in the consummation of the many important problems that he had planned for the future. He had no hobby save his task satisfactorily performed.

If John Polak had a guiding creed it must have been that proposed by Dean Briggs when he said, "Do your work—not just your work and no more, but a little more for the lavishing's sake; that little more that is worth all the rest. And if you suffer as you must, and if you doubt as you must, do your work. Put your heart into it and the sky will clear. Then out of your very doubt and suffering will be born the supreme joy of life."

His stimulating personality and indefatigable ability for work made those associated with him strive to always do better and better work. Leadership was a natural talent of John Polak's. He inspired enthusiasm and stimulated ambition. He commanded respect.

Dr. John Osborn Polak was born in Brooklyn, New York, March 12, 1870. His father was Karl Theodore Polak and his mother Mary Elizabeth Osborn Polak, whose family lived on Clinton Avenue, Brooklyn, for more than 100 years. He married Bertha Louise Pitkin on June 12, 1896—a lovable, kindly and devoted helpmate, ever mindful of his health and comfort—truly a doctor's wife. She died in 1924. One child—a daughter, Mary Osborn Polak—survives.

No citizen of Brooklyn was ever more proud of his "home town" than Dr. Polak. He was always "from Brooklyn" and was ever on the alert for Brooklyn's best interests—medical, educational and civic.

He gave freely of his time and money for the upbuilding of better medicine, higher standards of medical education and better civic conditions throughout the Borough of Brooklyn, and indeed throughout the nation. How he crowded the multiplicity of his interests into the "days of his life" still remains a mystery to those who knew him intimately.

Dr. Polak obtained his education at Rutgers Grammar School and from Rutgers College from which he received the Bachelor of Science degree in 1889 and the Master of Science in 1901. He was graduated in medicine from both the Long Island College Hospital of Brooklyn and the University of Vermont in 1891. He was awarded the Dudley Medal for Surgery upon his graduation from the Long Island College Hospital. Thus Dr. Polak, at the age of 21 years, began his medical career with signal attainments. With such a background it is little wonder that at the age of 61 years he had gained wealth, honor, and fame.

As a physician, Dr. Polak was kind-hearted, lovable, skillful; as an executive, able, equitable, sagacious; as a man, friendly, affable, inspiring—truly a gentleman. He had countless admirers—yes, many friends—all over the world. He was equally well known in the East, West, North and South.

As a teacher he was forceful, explicit, impressive. He had many loyal friends amongst his ex-students. His "boys" were ever dear to his heart. They had received instruction from him; he had received stimulation from them. One of his "boys" wrote in the "1931 Liehonian," the student yearbook of the Long Island College of Medicine, the following—"For twenty-five years his eyes have been directed toward the future while his hand and mind have dealt with the present and his heart has opened to his 'boys.' For twenty-five years he has carried the College on the crest of his fame and he has been the dynamic factor in every advance it has made. For twenty-five years he has sent his students into practice with a confidence born of his teachings. His name and that of the College are synonymous. Where Gynecology and Obstetrics are practiced his name is a byword. His surgical skill is tradition and his teaching is the model for thousands who are emulating him."

The world, unfortunately, is still heavily laden with "charity patients" and Dr. Polak had his share of these—and more. He radiated sunshine and happiness to countless numbers of poor, tired, sick and unhappy women. He thrilled in their appreciation of his encouragement. Dispensary and ward patients received from him the best he could give. He reveled in their gratitude. No private patient got more of him. Dr. Polak must have believed, with James Allen, that "there is no physician like cheerful thought for dissipating the ills

of the body; there is no comforter to compare with good-will for the dispersing the shadows of grief and sorrow.”

Dr. Polak lived a temperate life. He indulged in no excesses save his work. He died too young—far too young—for he might have accomplished even greater things had he lived through that useful decade just ahead of him. As with Jerome Bell, in the beautiful poem “Mystery,” we wonder

“What is this mystery men call death?
My friend before me lies; in all save breath
He seems the same as yesterday. His face
So like to life, so calm, bears not a trace
Of that great change which all of us so dread.
I gaze upon him and say: He is not dead,
But sleeps: and soon he will arise and take
Me by the hand. I know he will awake
And smile on me as he did yesterday;
And he will have some gentle word to say,
Some kindly deed to do; for loving thought
Was warp and woof to which his life was wrought.
He is not dead. Such souls forever live
In boundless measure of the love they give.”

—*Harvey Burleson Matthews.*

Original Communications

THE RELATION OF FORCEPS AND CESAREAN SECTION TO MATERNAL AND INFANT MORBIDITY AND MORTALITY*

BY E. D. PLASS, M.D., IOWA CITY, IOWA

(From the Department of Obstetrics and Gynecology, State University of Iowa)

WITH accurate morbidity statistics still unavailable, mortality rates must be the chief criteria by which obstetric practice is judged. Any general improvement in maternity care should be quickly reflected in a reduction of the death rate among mothers, as well as in a lowered incidence of stillbirths and of neonatal deaths. Conversely, stationary rates may be taken to indicate no improvement, and rising rates a falling off in the quality of obstetric practice. Irrespective of our feeling about statistics in general, reliable figures offer the only hope for fair comparison, and deaths are more easily computed than illness.

Official government statistics, as given out from year to year, appear to indicate that there is a rising maternal mortality rate. In 1915, the total puerperal death rate in the Birth Registration Area was 61 per 10,000 live births, while in 1929 this rate had risen to 70. The import of these figures may well be questioned, since the inclusion in the Birth Registration Area during the intervening years of many states having large colored populations would tend naturally toward a higher total rate. However, comparison of the puerperal death rates in the eleven states included in the original 1915 Birth Registration Area (Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Pennsylvania, Rhode Island, Vermont, and the District of Columbia) shows that the rate was slightly higher in 1929 than in the year of the first official statistics (61 as against 65 per 10,000 live births).

It is then at least safe to say that there has been no improvement during the past fifteen years in spite of the facts that (1) progressively more obstetric patients have been given hospital care during parturition, (2) the principles of aseptic and antiseptic technic have been more widely disseminated, and, (3) prenatal care has been developed as a notable experiment in preventive medicine. That these

*A report made to the White House Conference on Child Health and Protection, Washington, D. C., February, 1931.

factors can serve to lower the maternal mortality rate has been demonstrated in certain metropolitan areas (especially New York City and the Twin Cities of Minneapolis and St. Paul), but that they have failed for the country at large is obvious.

The stillbirth rate for the Registration Area has remained practically constant, while the deaths of infants under one month have declined only slightly and the deaths under one day remain unchanged. For New York, the State Department of Health² sponsors the following statement: "The movement of the death rates from causes operative during the first month of life has been less favorable. A considerable reduction was recorded in the mortality from congenital debility and premature birth, the rates being 27.2 in 1915 and 18.9 in 1929. On the other hand, the death rate from congenital malformations remained practically stationary, 5.6 and 5.7, while the rate from injuries at birth increased from 3.9 to 5.5. The total mortality under one month declined, but only 19 per cent, from 41.5 in 1915 to 33.7 in 1929. It is interesting to note that there has been practically no change in the relative number of deaths under one day." The increased number of early infant deaths recorded as due to birth injuries is confirmed by Frankel,³ who states that the increase has averaged 5 per cent per year, a 44 per cent increase from 1915 to 1929. Rodda⁴ reports that more than 50 per cent of early infant deaths and stillbirths are associated with intracranial injuries as shown by post-mortem, and Bolt⁵ says: "From 40 to 50 per cent of neonatal deaths reveal intracranial hemorrhages at autopsy."

Fahlbusch⁶ reports that neonatal deaths (first four days of life) are also increasing in various sections of Germany as follows:

Section	Neonatal Deaths (Per Cent)	
	1907	1924
Prussia	2.23	2.55
East Prussia	1.79	1.96
Westphalen	2.38	2.94
Rhine	2.42	2.84

and attributes the increase to the fact that more women are engaged in the industries.

From the general experience in this country, it is logical to conclude that prenatal supervision, improved aseptic technic, and hospitalization for delivery are either ineffective in conserving the life and health of mother and child, or that other factors are obscuring the good results that might otherwise have been evident. The most striking change in obstetric practice in the past decade and a half has been the marked relaxation in indications for intervention during labor and the great increase in operative deliveries. Little effort has been directed toward determining whether such interference actually marks an advance, although conservative thought has always opposed in-

tervention as being more dangerous to mother and child, on the theory that childbearing is essentially a normal physiologic process. A certain few of the old school have raised their voices on every occasion against the tide of radicalism, but apparently without stemming its rise.

Attempts to evaluate the factors leading up to this operative furor are apt to be incomplete, but it would seem reasonable to include the following as representing the most important:

1. The (often false) sense of security engendered by the use of modern antiseptics.
2. The almost universal employment of anesthetics.
3. An exaggerated idea of the value of an infant's life as compared to the life and health of its mother.
4. The demand on the part of obstetric patients for shorter and more comfortable labors.
5. Extension of the indications for operative induction or termination of labor to include the convenience of the patient, husband, doctor, or other person.
6. The education of the laity to a higher scale of fees for operative procedures, although often the value of services in nonoperative deliveries is much greater.

Other factors undoubtedly enter the picture and serve to confuse it, but the fact remains that there has been a tremendous increase in operative deliveries, especially in hospital practice, a change which may well be responsible for our failure to make any progress in the fight against the deplorable loss of life among mothers and newborn infants. If a mother can be spared pain without prejudicing her life or health or that of her child, and if a child's life can be saved without placing the mother in too great danger, the new obstetric conscience is admirable, but if the reverse is true, the older conservative obstetrics would seem better.

The purpose of the present report is to evaluate as accurately as possible the effects of forceps delivery and cesarean section on the life and health of the mother and her child. The enormous mass of data available presents a serious problem of selection, which is further complicated by the fact that statistics are presented from such divergent points of view that correlation is extremely difficult. Particular attention will be paid to the more recent reports.

THE RELATION OF MATERNAL DEATHS TO THE TYPE OF DELIVERY

The mere fact that many deaths after delivery (excluding cases where pregnancy has not advanced to 7 calendar months) occur after the artificial termination of labor does not necessarily implicate the mode of delivery, since operative intervention is commonly more necessary in complicated cases. Recent Children's Bureau statistics

show that among 4,965 maternal deaths, occurring in women seven months or more pregnant, data on the method of delivery are available in 4,839, of whom 2,225 (46 per cent) died after an operation aiming at delivery. Seven hundred and ninety-nine (16.5 per cent) succumbed after forceps, and 531 (11.0 per cent) following cesarean section.

RELATION OF MODE OF DELIVERY TO VARIOUS CAUSES OF DEATH

TABLE I. FROM CHILDREN'S BUREAU DATA COVERING 4,965 PUERPERAL DEATHS FOLLOWING DELIVERY AT SEVEN MONTHS OR MORE⁷

CAUSE OF DEATH	NO OBSTETRIC OPERATION		FORCEPS		CESAREAN SECTION	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
143 Accidents of pregnancy	116	4.45	5	0.63	3	0.56
144 Puerperal hemorrhage	275	10.55	132	16.52	41	7.72
145 Accidents of labor						
A. Cesarean section	---	----	---	----	134	25.24
B. Other operations	---	----	76	9.51	---	----
C. Other accidents of labor	278	10.66	50	6.26	10	1.88
146 Puerperal septicemia	901	34.56	215	26.91	141	26.56
147 Phlegmasia alba dolens, etc.	206	7.90	51	6.38	1	0.19
148 Puerperal albuminuria and convulsions	813	31.19	268	33.54	201	37.85
149 Following delivery, not specified	18	0.69	2	0.25	0	0.00
150 Diseases of the breast (puerperal)	---	----	---	----	---	----
Totals	2,607	100.00	799	100.00	531	100.00

The high percentage of "toxemia" deaths in the operative groups is worthy of note in view of the accumulated evidence to show that the conservative treatment of eclampsia is productive of better results than is immediate operative emptying of the uterus. The higher percentage of deaths due to infection (No. 146) after spontaneous labor should not be misinterpreted as indicating the relative safety of operative delivery in this connection. Obviously, the total number of spontaneous deliveries was far greater than the number of operative terminations, and, moreover, the number of deaths due directly to the operation is sufficient in either case to bring the total (No. 145 plus No. 146) above that for sepsis deaths after spontaneous labor.

Data for Wisconsin for 1927 and 1928, as reported by Calvert,⁸ show the type of delivery in 427 fatal cases out of 446 where the pregnancy had proceeded to viability of the child. In these 427 patients, operative intervention had been practiced in 70.1 per cent. Ninety-two deaths (21.5 per cent) followed forceps applications, and 67 (15.7 per cent) occurred after cesarean section.

In Massachusetts, in 1921, there were 525 maternal deaths, 87 being associated with delivery by cesarean section.⁹ Among 370 deaths among primiparous women analyzed by the State Board of Health of Massachusetts, 233 had been delivered by operation, 116 by cesarean section and 106 by forceps.

It is conceded that a radical increase in the number of operative deliveries is not followed by a corresponding rise in the death rate,

since, obviously, operations of convenience are less dangerous than those of necessity. However, it is generally admitted that interference with normal labor is accompanied by some added risk to both mother and child, although Little¹⁰ “. . . cannot accept the English view that cases delivered with forceps are more liable to infection than those delivered spontaneously”; while Bill¹¹ says “. . . , there was no more morbidity during the period when with proper technic more operative work was done than during the period covered by the first (conservative) series.” This is decidedly a minority opinion, which is cited to indicate that there is some opposition to the older established view. No one denies that febrile convalescence is more common after cesarean section than after spontaneous labor, the above statements applying only to “convenience” forceps.

FORCEPS DELIVERY

Until comparatively recently, the forceps was used very infrequently, and then only when the mother was unable to deliver herself, fetal indications not being recognized. The old doctor knew how to sit and wait, and the number of spontaneous deliveries he had was astounding, one elderly physician, who had always practiced in rural communities, boasting that he had used instruments only four times in more than 3,000 deliveries during a practice of over fifty years. By contrast, there are now a few clinics in this country where the application of forceps is routine, except where a precipitate delivery interferes with the obstetrician's plans. In the former, obvious indications must have been overlooked, whereas in the latter much absolutely needless interference is being practiced.

There is no general agreement as to what constitutes a reasonable indication for instrumental delivery, although more commonly it is said that interference should be practiced only “when an indication exists.” Delay in the second stage is generally taken to indicate instrumentation, but opinions differ widely as to what constitutes significant delay, while certain other maternal conditions, such as cardiac disease, pregnancy toxemia, and tuberculosis, are looked upon as justifying interference. From the standpoint of the fetus, prolapse of the cord is quite alone as a completely accepted indication, although Ehrenfest¹² states that 70 per cent of all forceps deliveries are done on fetal indications, fetal distress being assumed from variations in the fetal heart tones. There is, however, a growing suspicion that the fetal heart sounds do not faithfully reveal the condition of the fetus, and that changes in their rate do not justify the adoption of radical methods of delivery. Esch¹³ points out that if excessive compression of the head is considered responsible for the signs supposedly indicative of fetal distress, further compression of the head by forceps can only be detrimental to the child. The fact that so many children

survive such instrumentation is evidence enough that the condition is not serious. More recently, in Germany especially, complete anesthesia of the mother has been substituted for rapid delivery in assumed fetal distress with gratifying results.¹³ When fetal indications, except prolapsed cord, are ignored, there is no appreciable increase in stillbirths or in neonatal mortality, that can be attributed to lack of interference.¹⁴ This would make it seem that the good derived from active intervention is at least balanced by the pernicious effects of that practice. Ehrenfest¹⁵ remarks that "there is no acceptable proof extant for the assertion that forceps extraction is less dangerous to the infant than a long labor."

THE INCIDENCE OF FORCEPS DELIVERY

In response to the White House Conference questionnaire²⁰ concerning deliveries during 1929, 207 representative general hospitals having obstetrical services reported 120,999 deliveries with 21,097 forceps, an incidence of 17.4 per cent; while 16 special obstetric, or obstetric and gynecologic, hospitals reported 24,813 deliveries with 5,075 forceps, an incidence of 20.4 per cent. For the entire 223 institutions, there were 145,812 deliveries with 26,172 forceps, 17.9 per cent, one forceps in 5 or 6 deliveries. Among the general hospitals, the incidence varied from 0.5 per cent (1 forceps in 218 deliveries) to 81.1 per cent (99 forceps in 122 deliveries); while in the 16 special institutions, the spread was from 3.8 per cent (24 forceps among 635 deliveries) to 50.4 per cent (808 forceps in 1,602 deliveries).

In 127 of the 223 hospitals, the forceps incidence was not above the average for the entire group, 17.9 per cent; while in 87.5 per cent less than 30 per cent of all deliveries were instrumental. The fact that 6 institutions admit an incidence of over 50 per cent is interesting, but it is perhaps more significant that five of these hospitals are in Ohio, and one in West Virginia. Table II shows the distribution of the hospitals according to the reported incidence of forceps delivery.

TABLE II. PERCENTAGE INCIDENCE OF FORCEPS IN REPORTING HOSPITALS

PER CENT OF FORCEPS DELIVERIES	NO. OF HOSPITALS	PER CENT OF HOSPITALS
0- 9.9	69	31.1
10.0-19.9	74	32.8
20.0-29.9	53	23.6
30.0-39.9	17	7.6
40.0-49.9	6	2.7
50.0-59.9	2	0.9
60.0-69.9	2	0.9
70.0-79.9	1	0.4
80.0-89.9	1	0.4

Since the data permitted grouping the reporting hospitals according to their location, the following table was prepared to cover the states which reported more than 5,000 deliveries.

TABLE III. FORCEPS INCIDENCE IN VARIOUS STATES

STATE	DELIVERIES REPORTED	FORCEPS DELIVERIES	
		NO.	PER CENT
Ohio	9,856	3,417	34.7
Massachusetts	13,994	3,442	24.8
New York	34,268	6,533	19.1
Pennsylvania	11,018	1,276	12.7
California	8,275	1,920	17.4
Illinois	14,055	1,172	14.2
Michigan	10,022	1,885	13.4
New Jersey	5,467	568	10.4

When the data from the entire number of reporting hospitals are arranged according to recognized state groups, Table IV appears:

TABLE IV. PERCENTAGE INCIDENCE OF FORCEPS ACCORDING TO STATE GROUPS

STATE GROUP	NO. OF HOSPITALS	NO. OF DELIVERIES	NO. OF FORCEPS	PER CENT OF FORCEPS
New England States (<i>Me., Vt., N. H., Mass., Conn., R. I.</i>)	25	18,717	4,182	22.3
Middle Atlantic States (<i>N. Y., N. J., Pa., Del., Md., D. C., Va., W. Va.</i>)	87	57,463	9,925	17.3
East Central States (<i>Mich., Wis., Ill., Ind., Ohio, Ky.</i>)	53	39,641	7,371	18.6
West Central States (<i>Minn., N. Dak., S. Dak., Neb., Ia., Kan., Mo.</i>)	17	6,770	1,061	15.7
East Southern States (<i>Tenn., N. C., S. C., Ga., Ala., Miss., Fla.</i>)	14	6,340	848	13.4
West Southern States (<i>Okla., Ark., Texas, La.</i>)	10	4,953	1,022	20.6
Southwestern States (<i>Colo., Utah, Nev., Calif., Ariz., N. Mex.</i>)	12	9,009	1,200	13.3
Northwestern States (<i>Wash., Ore., Mont., Idaho, Wyo.</i>)	5	2,919	560	19.2

Such figures are indicative of the frequent use of forceps but give no evidence concerning the incidence as compared with the past.

TABLE V. FORCEPS INCIDENCE IN THE HARTFORD GENERAL HOSPITAL²¹
1916 TO 1928

YEAR	NO. OF DELIVERIES	NO. OF FORCEPS	PER CENT OF FORCEPS
1916	985	68	6.9
1917	1,026	69	6.7
1918	848	86	10.1
1919	970	94	9.7
1920	979	90	9.2
1921	794	76	9.6
1922	881	91	10.3
1923	1,114	116	10.4
1924	1,154	147	12.7
1925	1,285	157	12.2
1926	1,377	165	12.0
1927	1,411	189	13.4
1928	1,507	243	16.1

James R. Miller, of Hartford, Connecticut, has provided figures for the Hartford General Hospital covering the thirteen years up to 1928. These data are placed in tabular form. It may be assumed that this table represents conditions in many institutions, although in certain hospitals the rate of increase was undoubtedly more rapid.

Since no figures are available in the literature for the forceps incidence in practice outside hospitals, an attempt was made to secure such data from practitioners in Iowa in two ways: First, from birth certificates,²² which, since April 1, 1930, have included a question concerning the method of birth, and second, from a questionnaire²³ distributed among the members of the writer's postgraduate classes during the past winter. In the latter instance, many of the figures are admittedly approximations, but in spite of this inherent inaccuracy they are included for comparison.

Among 19,675 birth certificates,²² forceps were specified 678 times, an incidence of 3.45 per cent. In cities of over 10,000 population, there were 6,502 births with 324 forceps, 4.99 per cent; while among 13,173 deliveries in communities of less than 10,000 population, including a great majority of home deliveries, there were only 354 forceps, 2.69 per cent.

The approximate data obtained from 70 questionnaires²³ covered 42,394 deliveries, of which more than 91 per cent were conducted in the home. There were 3,235 forceps operations, an incidence of 7.6 per cent.

The apparent discrepancies between the two sets of figures may be explained partly by the fact that in the birth certificate data there were 1,224 cases in which the type of operative delivery was not specified. At any rate such figures would indicate that in general practice the forceps is used in something less than 10 per cent of all cases.

European obstetricians have been more inclined to conservatism than have American operators, and have given serious thought to the forceps incidence consistent with the best results. Heinlein¹⁶ is of the opinion that the optimum incidence for instrumental delivery is 2 to 3 per cent, while Pritzi¹⁷ names 3.5 per cent. Thurn-Rumbach¹⁸ reports 37,643 deliveries with a forceps incidence of 2.31 per cent and a total fetal mortality (exclusive of macerated fetuses) of 4.01 per cent, while Santner,¹⁹ with 21,140 deliveries and a total forceps incidence of 0.82 per cent, had a total fetal death rate of 2.37 per cent, a better figure than can be found in a comparable series where the forceps incidence was higher.

In general, the recorded incidence of forceps deliveries in foreign clinics is decidedly lower than those presented from representative hospitals in this country.

Such data could be multiplied many times, but their inclusion would merely emphasize the fact that when forceps is limited to actual need, on the basis of maternal indications, instrumental delivery is uncommon, and probably represents not more than 5 per cent of any given consecutive series. Any great increase over this figure savors of meddling midwifery.

TABLE VI. FORCEPS INCIDENCE IN FOREIGN CLINICS

AUTHOR	PERCENTAGE OF FORCEPS
Tottenham ²⁴	2.7
Jaschke ²⁵	4.8
Pritzi ¹⁷	2.96
Klaften and Bodnar ²⁶	3.0

MATERNAL MORBIDITY AFTER FORCEPS DELIVERY

Morbidity following forceps delivery, as based upon postpartum elevations of temperature and upon physical injury, depends particularly upon the type of forceps (low, mid, or high), although other factors, such as the skill of the operator, the surroundings under which he works, and the initial indication play a considerable rôle. The higher the presenting part at the time of the application, the greater the risk of injury and infection, with the former being a prominent precursor of the latter. Convenience indications carry a considerably less risk than do actual maternal indications. The few concrete figures available show conclusively that postpartum fever is more common following forceps for genuine indications than after spontaneous delivery, with comparable figures not available for "convenience" forceps. However, Schoeneck,²⁷ whose forceps incidence is high, remarks: "The morbidity in spontaneous labors was less than in delivery by prophylactic forceps or version; lacerations of the birth canal were lessened in incidence and degree; and the maternal and fetal mortality were nil." Representative morbidity figures based upon elevations of temperature are recorded; obviously the percentages will vary depending upon the frequency with which the temperature is taken and with the point chosen as being abnormal. In these instances temperatures were taken every four hours and any elevation above 100.4° F. placed the patient in the febrile group.

TABLE VII. FEBRILE CONVALESCENCE AFTER FORCEPS DELIVERY

NAME	PLACE	PERCENTAGE MORBIDITY		
		LOW FORCEPS	MID FORCEPS	HIGH FORCEPS
Peterson ²⁸	Ann Arbor	35.2	36.4	53.8
Plass	Iowa City	29.0	42.2	50.0
Plass	Detroit	28.0	33.0	33.0

Stander²⁹ in analyzing 1,000 consecutive forceps deliveries noted that the puerperium was febrile in 354, 35.4 per cent. He does not differentiate between the various types of operation.

MATERNAL MORTALITY AFTER FORCEPS DELIVERIES

The maternal mortality following forceps delivery, as obtained from the nation-wide questionnaire,²⁰ is surprisingly low, possibly because deaths from other causes in patients delivered by forceps were placed in other categories. At any rate, 116 hospitals reported on this item, listing 11,189 forceps deliveries with only 36 maternal deaths, a mortality incidence of 0.32 per cent. This does not correlate well with data previously cited showing that from 10 to 25 per cent of patients dying after delivery of viable children had been delivered by forceps. However, other available figures indicate that the mortality is low: Duncan³⁰ records 886 forceps with no maternal death, Schoeneck²⁷ did 241 forceps without maternal mortality, Peterson²⁸ reports 3 maternal deaths among 293 forceps, and I have had 3 deaths in 255 forceps deliveries. Stander²⁹ records a gross maternal mortality of 1.1 per cent in 1,000 forceps cases. The Iowa questionnaire²³ showed 21 deaths among 3,235 forceps deliveries, 0.65 per cent. King³¹ reports 8 deaths among 150 consecutive forceps at the Charity Hospital, New Orleans, all except possibly two being in neglected cases admitted as emergencies.

Available figures from Europe include:

TABLE VIII. MATERNAL MORTALITY AFTER FORCEPS (EUROPE)

AUTHOR	NO. OF FORCEPS	PERCENTAGE MORTALITY
Martin and Spieckhoff ³²	630	0.7
Neumann ³³	132 (Kielland)	2.3
Pritzi ¹⁷	920	2.2
Klaften and Bodnar ²⁶	312	3.9
Jaschke ²⁵	308	2.3

In comparing the rates from this country and Europe, it should be kept in mind that the "convenience" forceps is essentially an American institution, and that its death risk is admittedly low.

Statistics from large groups of the population abroad also show that the mortality incident to forceps delivery is not especially high. Among 23,729 operative deliveries in Norway from 1910 to 1918, there were 18,265 forceps with 122 maternal deaths, 0.67 per cent, while in Baden from 1900 to 1909, the maternal death rate after forceps was 0.6 per cent, and in Bavaria from 1901 to 1906 it was 1.3 per cent.

TABLE IX. THE RELATIVE INCIDENCE OF LOW, MID, AND HIGH FORCEPS, AND THE CONSEQUENT MATERNAL MORTALITY

AUTHOR	LOW FORCEPS		MID FORCEPS		HIGH FORCEPS	
	INCI- DENCE	MOR- TALITY	INCI- DENCE	MOR- TALITY	INCI- DENCE	MOR- TALITY
Stander ²⁹	5.4	--	0.9	--	0.12	--
Duncan ³⁰	13.5	0.0	7.6	0.0	0.8	0.0
Klaften and Bodnar ²⁶	1.6	3.7	0.33	2.9	0.1	10.0
Peterson ²⁸	--	0.0	--	0.0	--	23.0
Iowa questionnaire ²³	4.7	0.5	2.3	0.7	0.56	1.7
Plass (Iowa City)	5.7	1.1	2.3	1.4	0.26	0.0
Plass (Detroit)	7.7	1.1	1.3	0.0	0.3	0.0

It is generally admitted that the risk to the mother is less as the presenting part is lower in the pelvis when the forceps application is made, but actual figures on the relative incidence of low, mid, and high forceps, and the consequent maternal mortality are not plentiful. Table IX gives the data collected on these points.

No data are available for clinics with high rates of interference, but it may be assumed that the increase is largely in the low forceps group and that the maternal mortality is increased little or none.

FETAL MORBIDITY AND MORTALITY AFTER FORCEPS

It is impossible to determine the immediate morbidity of the child after an instrumental birth, but such injuries as facial paralysis, superficial abrasions, and nonfatal intracranial hemorrhages are recognized as being more common than after spontaneous birth. The later results have been studied, especially by Wetterdal,³⁵ who concludes that mid and high forceps "... have been shown to be associated with much greater risk for the child by way of serious mental defects than is the case with those spontaneously delivered or with children delivered by low forceps." His data may be summarized as shown in Table X.

TABLE X. LATE RESULTS OF FORCEPS BIRTH, WETTERDAL*

	2,000 SPONTANEOUS BIRTHS		1,624 LOW FORCEPS		285 MID FORCEPS		91 HIGH FORCEPS	
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT
Died in hospital	51(2,000)	2.55	117(1,624)	7.2	41(285)	14.4	28(91)	30.8
Died after discharge	270(1,721)	15.7	196(1,298)	15.1	42(210)	20.0	11(60)	18.3
Well at 12 years	1,248(1,721)	72.5	973(1,298)	75.0	138(210)	65.7	39(60)	65.0
Mentally defective	113(1,721)	6.6	76(1,298)	5.9	21(210)	10.0	8(60)	13.3
Physically defective	90(1,721)	5.2	53(1,298)	4.1	9(210)	4.3	2(60)	3.3

*The figures in parentheses indicate the number of total cases used for computing the percentages.

More data are available upon the stillbirth rate and upon the total infant mortality following forceps, to indicate that these rates are generally higher than in spontaneous births. Ehrenfest³⁶ says, "Serious and fatal lesions occur frequently in the course of spontaneous and easy labors, especially in premature infants, but are more common after forceps. . . ." The death rate depends upon the type of operation (low, mid, or high), and upon the skill of the operator and the facilities which he can command, as well as upon the indication. The actual infant mortality should be higher when intervention is practiced only upon clean-cut indications than when it is done merely as a convenience, in patients who would otherwise deliver themselves within a short period. Obviously then, a reduced percentage of infant

deaths in forceps deliveries where the operative incidence is high does not argue that operative intervention is safest for the child, but rather that "convenience" forceps is not especially severe upon the newborn.

TABLE XI. TOTAL INFANT MORTALITY FOLLOWING FORCEPS

AUTHOR	ALL FORCEPS	LOW FORCEPS	MID FORCEPS	HIGH FORCEPS
<i>(United States and Canada)</i>				
Peterson (Ann Arbor) ²⁸	3.1	1.7	7.4	61.5
Iowa questionnaire ²³	8.1	4.6	9.3	32.8
King (New Orleans) ³¹	18.7	--	--	--
Stander (Baltimore) ²⁹	10.0	--	--	--
Duncan (Montreal) ³⁰	4.7	1.1	8.1	31.4
Carroll (Toledo) ³⁷	--	--	10.0	13.3
Plass (Iowa City)	5.5	5.7	5.6	0.0
Plass (Detroit)	7.4	2.2	33.3	33.3
<i>(Foreign Clinics)</i>				
Wetterdal ³⁵	9.3	7.2	14.4	30.8
Klaften and Bodnar ²⁶	16.3	14.2	23.5	50.0
Jaschke ²⁵	10.4	--	--	--
Martin and Spieckhoff ³²	8.2	--	--	--
Neumann (Kielland forceps) ³³	6.1	--	--	--
Pritzi ¹⁷	11.6	--	--	--
Gauss ³⁸	10.3	--	--	--
Baisch ³⁹	--	--	--	43 to 50

The excessive infant death rate following high forceps furnishes a striking argument against the performance of this operation except under unusual circumstances. It is, however, doubtful whether, with the presenting part high and a definite maternal indication for delivery, version and extraction offers much better chances for the child, and certainly under these conditions the danger to the mother of cesarean section would be great. In fact, a satisfactory method for handling these difficult cases has not yet been devised.

Study of 591 stillbirths in Iowa²² reveals that 419 followed spontaneous labor, while in 172 instances the mother had been delivered by operation, according to Table XII:

TABLE XII. STILLBIRTH INCIDENCE ACCORDING TO METHOD OF DELIVERY
IOWA BIRTH CERTIFICATES—APRIL 1 TO SEPTEMBER 30, 1930

METHOD OF DELIVERY	NUMBER OF DELIVERIES			STILLBIRTH RATE PER CENT		
	URBAN*	RURAL	TOTAL	URBAN	RURAL	TOTAL
Spontaneous	5,651	11,983	17,634	2.37	2.38	2.37
Operative	851	1,190	2,041	5.52	10.50	8.43
Low forceps	215	207	422	0.9	6.3	3.5
Mid forceps	65	64	129	1.5	3.1	2.3
High forceps	44	83	127	9.0	9.7	9.4
Cesarean section	77	62	139	6.5	11.3	8.4
Operation not specified	450	774	1,224	7.8	12.3	10.6
Total	6,502	13,173	19,675	2.78	3.11	3.00

*Urban is used to designate communities of more than 10,000 population.

It should be noted that while the operative incidence in the urban communities was higher than in the rural districts (13.47 to 9.04 per

cent), the stillbirth rate following operation was only one-half as great (5.52 to 10.50 per cent), undoubtedly indicating a greater number of actual indications in the latter, as well as less favorable conditions for delivery.

CESAREAN SECTION

Perhaps the most striking evidence of the present operative furor in obstetrics is furnished by the cesarean section incidence, which has increased many times in the past generation by reason of the gradual relaxation of the indications for its performance. Previously, abdominal delivery was done only for a certain few reasons (contracted pelvis, obstructed birth canal, and maternal conditions such as uncompensated cardiac disease), which are encountered with relative infrequency. These still remain the only undisputed indications, but the range of employment of the operation has been extended until it includes every imaginable complication of pregnancy and labor. In still other cases, the desire of the patient for abdominal delivery has been the deciding factor, and even mere convenience must enter the picture to explain the high incidence reported by some clinics. The commonly accepted dictum, "Once a cesarean, always a cesarean," constantly replenishes the fire of the operative orgy. Conservative obstetricians, who support this working rule of abdominal delivery where it has been done previously, find that quite one-half of their cesarean sections are performed because of a previous abdominal delivery done for conditions which are not apparent at the time.

The newer indications, excepting those in the "convenience" group, should almost without exception be classed as "fetal," since the only reason for their performance is that they increase the chances for living children. Gauss²⁸ comments as follows upon the validity of such "fetal" indications: ". . . a section done for a fetal indication, i.e., placenta previa or eclampsia, is not justified because the life of a single child (except in very exceptional cases) is nothing compared to preserving the health, fertility, and the ability to bear child in a natural way, of the parturient woman," but the majority of obstetricians, especially in this country, have succumbed to the "exaggerated idea of the value of an infant's life as compared to the life and health of its mother."

THE GENERAL INCIDENCE OF CESAREAN SECTION

Figures taken from hospital records obviously give little information about the incidence of cesarean section in communities as a whole, since practically all abdominal deliveries are done in institutions, whereas a large proportion of other deliveries are conducted in the home. Accurate figures for certain large cities and for one state are, however, available to show the number of cesarean sections in relation to the total number of deliveries. (Table XIII.)

TABLE XIII. CESAREAN SECTIONS IN RELATION TO TOTAL DELIVERIES

CITY OR STATE	AUTHOR	TOTAL DELIVERIES	TOTAL CESAREAN SECTIONS	PERCENTAGE CESAREAN SECTIONS
Detroit	Welz ⁴⁰	33,480	154	0.46
Hartford	Miller ⁴¹	76,502	674	0.88
New Orleans	Gynec. & Obst. Soc. ⁴²	61,966	300	0.48
Massachusetts	DeNormandie ⁴³	90,904	1,161	1.28

The Iowa questionnaire²³ showed an incidence of cesarean section of 0.38 per cent among 42,394 deliveries; while evidence from Iowa birth certificates²² showed an incidence of 0.70 per cent, with 1.22 per cent among 6,502 urban deliveries as against 0.47 per cent in 13,173 rural cases.

By contrast, it is reported³⁴ that in Norway, in 1917-1918, only 0.15 per cent of all confinements were completed by cesarean section, while Ilkevich, Selicky, and Levy⁴⁴ record 309,468 deliveries in Moscow during 1921 to 1927, with 743 cesarean sections, an incidence of 0.24 per cent.

CESAREAN SECTIONS IN HOSPITAL DELIVERIES

The questionnaire²⁰ sent to hospitals in this country by the White House Conference was completed by 104 general hospitals with obstetric wards and by 15 special obstetric and gynecologic institutions, as to the total number of cesarean sections done in 1929.

TABLE XIV. TOTAL CESAREAN SECTIONS IN 119 U. S. HOSPITALS

	TOTAL DELIVERIES	TOTAL CESAREAN SECTIONS	PERCENTAGE CESAREAN SECTIONS
104 general hospitals	69,422	2,023	2.9
15 special hospitals	24,813	691	2.9
Total	94,235	2,714	2.9

The incidence among the reporting hospitals varied from a fraction of 1 per cent to 14.6 per cent (190 cesarean sections in 1,302 deliveries).

When these hospital data are arranged according to the location of the institutions some interesting facts appear.

TABLE XV. CESAREAN SECTION INCIDENCE ACCORDING TO GEOGRAPHIC LOCATION

113 U. S. HOSPITALS				
STATE GROUP	NO. OF HOSPITALS	NO. OF DELIVERIES	NO. OF CESAREAN SECTIONS	PER CENT OF CESAREAN SECTIONS
New England States	18	15,532	520	3.3
Middle Atlantic States	45	37,734	1,143	3.0
East Central States	24	21,287	446	2.1
West Central States	7	3,125	46	1.5
East Southern States	7	4,989	86	1.7
West Southern States	3	1,742	61	3.5
Southwestern States	8	6,405	240	3.7
Northwestern States	1	826	27	3.3

Other reports from single hospitals and groups of hospitals confirm these incidence figures and indicate that cesarean sections are becoming very common in the majority of institutions, although there is an occasional marked exception, as in Tiber's⁴⁹ report covering three hospitals in Minneapolis and St. Paul.

TABLE XVI. ADDITIONAL FIGURES ON HOSPITAL INCIDENCE OF CESAREAN SECTION

AUTHOR	LOCATION	NO. OF DELIVERIES	CESAREAN SECTIONS	
			NO.	PER CENT
Thompson ⁴⁵	Los Angeles	33,873	1,429	4.2
Ronsheim and Daichman ⁴⁶	Brooklyn	24,217	565	2.3
Duncan ³⁰	Montreal	4,025	178	4.4
Carroll ³⁷	Toledo	883	18	2.0
Sage ¹⁷	Omaha	2,510	44	1.7
Smith ⁴⁸	Indianapolis	2,033	106	5.2
Tiber ⁴⁹	Minneapolis-St. Paul	26,885	70	0.26

Figures from two institutions may be quoted to indicate how the incidence of abdominal delivery has increased during the past several years.

TABLE XVII. YEAR-BY-YEAR INCIDENCE OF CESAREAN SECTIONS IN TWO HOSPITALS

YEAR	CHICAGO LYING-IN HOSPITAL GREENHILL ⁵⁰			HARTFORD GENERAL HOSPITAL MILLER ⁴¹		
	TOTAL	CESAREAN	PER CENT	TOTAL	CESAREAN	PER CENT
	DELIVERIES	NO.		DELIVERIES	NO.	
1916-17	2,134	20	0.9	985	24	2.4
1917-18	2,895	32	1.1	1,026	29	2.8
1918-19	3,393	42	1.2	885	20	2.3
1919-20	3,268	43	1.3	970	35	3.6
1920-21	3,362	46	1.4	979	33	3.4
1921-22	3,683	65	1.8	794	29	3.7
1922-23	3,886	78	2.0	881	37	4.2
1923-24	4,042	100	2.5	1,114	68	6.1
1924-25	4,312	119	2.8	1,154	46	4.0
1925-26	4,350	119	2.7	1,285	39	3.0
1926-27	4,307	113	2.6	1,377	60	4.3
1927-28	4,658	128	2.7	1,411	67	4.8
1928-29	4,603	139	3.0	1,507	65	4.3

The type of cesarean section reported by the various hospitals is of interest in view of the efforts being made to popularize the low (cervical) operation. Among the general hospitals, there were 2,748 classical sections as against 546 of the low variety (5 to 1); whereas the special institutions reported 388 classical and 303 cervical operations (1.3 to 1). By contrast, Winter's⁵¹ statistics for Germany in 1928 showed 438 classical as against 3,354 cervical operations (1 to 7.7).

Individual foreign clinics show a wide variation in the total incidence of cesarean section, with little or none of the tendency toward excessively high rates reported in this country.

TABLE XVIII. CESAREAN SECTION INCIDENCE IN FOREIGN CLINICS

AUTHOR	TOTAL DELIVERIES	TOTAL CESAREAN SECTIONS	PER CENT OF CESAREAN SECTIONS
Stockholm Lying-In Hospital (quoted by Kosmak ⁵⁵)	3,148	2	0.06
Tottenham ²⁴	1,576	2	0.13
Lehoczky-Semmelweiss ⁵²	24,793	128	0.52
Pritzi ¹⁷	31,053	343	1.1
Wille ⁵⁴	28,917	357	1.2
Hirsch ⁵³	4,129	101	2.4
Schweitzer (quoted by Hirsch ⁵³)	7,070	236	3.3
Jaschke ²⁵	6,458	253	3.9

In 1928, Hirsch⁵³ urged the more frequent use of abdominal delivery in a statement which includes the following: "The mother's chances in delivery by cesarean section are today better than by the competing methods of vaginal delivery." This statement precipitated many adverse opinions with very little support. Winter,⁵¹ arguing against such radicalism, used certain collected German statistics for 1928, and reviewed 4,450 abdominal deliveries with a total maternal mortality of 7.1 per cent, and a mortality due to the operation itself of 4.2 per cent. Essen-Möller⁵⁶ also takes a strong stand against Hirsch's view, saying: "No; surgical intervention is not intended to shorten a physiologic process, nor merely to alleviate it. It is permissible only after thorough consideration of the *pros* and *cons*." Gauss⁵⁸ especially decries abdominal delivery for fetal indications, and includes in the latter eclampsia and placenta previa, where equally good results for the mother can be obtained by delivery from below, but where cesarean section admittedly reduces the fetal death rate.

MATERNAL MORBIDITY FOLLOWING CESAREAN SECTION

Maternal morbidity, as expressed in terms of fever after delivery, is considerably increased after cesarean section as compared with spontaneous delivery. Different morbidity standards make it difficult to compare the reports from various clinics, but a summary of the published results leads to the belief that from 20 to 65 per cent of patients having an abdominal delivery have a temperature above 100.4° F. during convalescence. Another direct result of the operation which should be considered in the light of a disability concerns itself with the scar in the uterus. The line of incision commonly represents a weakened area with consequent danger of rupture in subsequent pregnancies and labors. With the classical incision, this danger is usually given as 4 per cent, with the risk after the cervical section probably somewhat less, but nevertheless definite. The fear of another pregnancy with a second operation should also be viewed as a disability. When the operation is done for incidental indications, the risk of subsequent operations should really be charged against the initial procedure.

MATERNAL MORTALITY FOLLOWING CESAREAN SECTION

The chief argument against abdominal delivery is its associated mortality.

Paine⁵⁷ states that "Cesarean section is recognized as having in itself the highest maternal mortality of any delivery operation." Another adverse argument is advanced by Essen-Möller,⁵⁶ who stresses "... the fear of the mother after cesarean section that she may become pregnant again, and the significance such a state of mind may possibly have for the population." Hellmuth⁵⁸ followed 112 patients who had had 133 cesarean sections, and found that after the first operation 30 per cent remained sterile, while after the second cesarean 64 per cent were sterile. Gauss³⁸ noted that after cesarean section 58 per cent of the women became pregnant the second time, 15 per cent the third time, and only 3 per cent the fourth time, so that a single marriage in women upon whom cesarean sections are done produces only 1.8 children, whereas to maintain the population 3.46 children would be required.

It has already been pointed out that a considerable number of total maternal deaths follow cesarean section, 10.7 per cent in the Children's Bureau statistics,⁷ and 15.7 per cent in Calvert's Wisconsin tabulation.⁸ For 1929, 136 hospitals²⁰ reported on the total number of maternal deaths and on the deaths among patients delivered by cesarean section. The maternal deaths totaled 685, of which 133 (19.4 per cent) had been subjected to cesarean section.

From the Conference questionnaire²⁰ relating to figures for 1929, it is found that 138 hospitals recorded 2,273 cesarean sections with 134 maternal deaths, 5.9 per cent.

Mortality figures for cesarean sections in large sections of the population are afforded by the few extensive compilations already mentioned. (Table XIX.)

TABLE XIX. MATERNAL MORTALITY FOLLOWING CESAREAN SECTION. HOSPITALS IN THE UNITED STATES

AUTHOR	LOCATION	CESAREAN SECTION MORTALITY PER CENT
Welz ⁴⁰	Detroit	13.0
Miller ⁴¹	Hartford	4.5
Smith ⁴⁸	Indianapolis	11.3
Tiber ⁴⁹	Minneapolis-St. Paul	5.7
Thompson ⁴⁵	Los Angeles	4.2
DeNormandie ⁴³	Massachusetts	8.8
Gordon ⁵⁹	Brooklyn	7.1
Gynec. and Obst. Soc. ⁴²	New Orleans	16.1
Davis ⁶³	Houston	14.4

Greenhill⁵⁰ records 1,059 cesarean sections at the Chicago Lying-In Hospital with a total maternal mortality of 1.7 per cent, and Williams⁶⁴ reports 349 cases at the Johns Hopkins Hospital with a gross mortality of 12, 3.4 per cent, for the best results reported in this country for comparable series.

The results of large series of operations abroad correspond closely to those reported from the United States. Holland⁶² analyzed 4,197 cesarean sections done in Great Britain and Ireland during the years 1911 to 1920, and found a gross maternal mortality of 7.2 per cent, while Winter's collected German statistics for 1928⁵¹ showed 4,450 operations with a mortality of 7.1 per cent.

When all such figures are examined, it becomes clear that the average death rate following cesarean section is between 5 and 10 per cent, probably nearer the latter figure. Various factors help to determine the mortality, especially (1) the time of performance of the operation, (2) the indication for the intervention, and (3) the type of operation, and the operator.

Holland's classical report⁶² emphasized the relation between the time of operation and the maternal risk, and all subsequent observations have confirmed his findings, which stress the fact, too little appreciated, that elective section done before the onset of labor carries a low mortality, while emergency operations are extremely dangerous. Among 1,953 abdominal cesarean sections for contracted pelvis, the following death rates prevailed (Table XX).

TABLE XX. MATERNAL MORTALITY FOLLOWING CESAREAN SECTION FOR CONTRACTED PELVIS. (HOLLAND)

TIME OF OPERATION	NO. OF OPERATIONS	MATERNAL DEATHS	
		NO.	PER CENT
Not in labor	1,202	19	1.6
Early in labor	389	7	1.8
Late in labor	220	22	10.0
After induction of labor	35	5	14.3
After attempts at vaginal delivery	107	29	27.1

TABLE XXI

INDICATION	HOLLAND ⁶²		GORDON ⁵⁹	
	NO. OF CESAREAN SECTIONS	PER CENT DEATHS	NO. OF CESAREAN SECTIONS	PER CENT DEATHS
Contracted pelvis	3,372	4.1	934	5.8
Eclampsia and other toxemias	231	30.3	210	16.2
Antepartum hemorrhage	208	16.8	117	6.0
Other conditions	386	12.4	544	6.3

TABLE XXII. INDICATIONS FOR CESAREAN SECTIONS (GREENHILL)

INDICATION	PER CENT MATERNAL MORTALITY
Disproportion	0.8
Repeated cesarean section	1.6
Toxemia without convulsions	1.2
Eclampsia	6.3
Placenta previa	0.0
Abruptio placentae	7.1
Cardiac disease	3.4
Inertia	0.0

Holland,⁶² Greenhill,⁵⁰ and Gordon⁵⁹ furnish evidence concerning the relation between the indication for the operation and the mortality rate.

Greenhill's excellent report⁵⁰ shows a similar difference with a lower gross mortality. (Table XXII.)

Operations done for strict maternal indications appear to have a lower death rate than those for fetal indications (eclampsia, antepartum bleeding, etc.). Since the operation has been extended in scope largely along the latter lines, the wisdom of such extension may be doubted.

The low cesarean section (two-flap, cervical, etc.) has been advanced as safer than the older classical operation, and in certain hands seems to have justified this opinion, although the figures which have been collected leave the question in doubt. (Table XXIII.)

TABLE XXIII. COMPARATIVE MORTALITY OF THE CLASSICAL AND CERVICAL SECTION

	CLASSICAL CESAREAN SECTION			CERVICAL CESAREAN SECTION		
	NO. OF OPERATIONS	DEATHS NO.	PER CENT	NO. OF OPERATIONS	DEATHS NO.	PER CENT
Thompson ⁴⁵	1,060	43	4.1	262	13	4.9
Greenhill ⁵⁰	147	7	4.8	874	11	1.3
Quigley ⁶¹	104	2	1.9	61		
Ronsheim and Daichman ⁴⁶	529	16	3.0	36	0	0.0
King ⁶⁰	34	3	8.8	36	2	5.5
Winter ⁵¹	438	28	6.4	3,354	4	11.1
Jaschke ²⁵	32	5	15.6	221	124	3.7
Williams ⁶⁴	255	4	1.6	56	13	5.8
					1	1.8

Davis⁶³ in reporting the cesarean sections in Houston for the years 1923 to 1926 brought out the fact that in that period there had been 51 operations done by general surgeons and general practitioners with a death rate of 33 per cent, while 56 operations were performed by obstetricians alone or in association with general surgeons with a mortality of only 1.8 per cent. Such figures emphasize the need for judgment rather than the demand for operative skill.

The radical cesarean, or cesarean hysterectomy, as recommended for use in emergency cases, especially in the presence of infection, has a considerably lower mortality than either the classical or cervical conservative operation done under similar circumstances. Williams⁶⁴ reports 126 such operations with 10 deaths (8.0 per cent), while Greenhill⁵⁰ records 38 without a death.

INFANT MORTALITY FOLLOWING CESAREAN SECTION

The chief argument advanced for the wider use of cesarean section is that it conserves infant life, and theoretically this is true, since, with but few exceptions, a dead fetus should contraindicate the operation. General statistics, however, fail to show a saving of infant life, although certain institutions are able to record a low fetal mortality. (Table XXIV.)

TABLE XXIV. CESAREAN SECTION INFANT MORTALITY (UNITED STATES)

AUTHOR	PLACE	PER CENT STILLBIRTHS AND NEONATAL DEATHS
Welz ⁴⁰	Detroit	11.0
Miller ⁴¹	Hartford	15.3
Smith ⁴⁸	Indianapolis	8.7
Tiber ⁴⁹	Minneapolis-St. Paul	14.3
Gynec. and Obst. Soc. ⁴²	New Orleans	18.9
Gordon ⁵⁰	Brooklyn	8.7
Thompson ⁴⁵	Los Angeles	7.9
Carroll ³⁷	Toledo	11.1
King ⁶⁰	New Orleans	11.4

Figures from the Iowa questionnaire²³ show a 10 per cent infant death rate in 162 cesarean sections, while data from the Iowa birth certificates²² reveal 8.4 per cent of stillborn children in 139 cesarean sections, with no figures on neonatal deaths.

The Conference questionnaire²⁰ revealed 120 hospitals reporting on the infant deaths among women delivered by cesarean section, with 1,938 operations and 168 infant deaths, 8.7 per cent.

By contrast, Greenhill⁵⁰ reports a total infant death rate of 4.5 per cent in 874 sections, Quigley⁶¹ 4.2 per cent in 165 operations, and Duncan³⁰ 2.8 per cent in 178 cases.

Winter's⁵¹ collected 1928 German statistics show a total infant mortality of 403 in 4,450 operations (9.0 per cent), with almost one-half (175) of the children certainly dead when the operation was undertaken. Other comparable foreign figures include (see Table XXV).

TABLE XXV. CESAREAN SECTION INFANT MORTALITY (FOREIGN)

AUTHOR	INFANT DEATH RATE AFTER CESAREAN SECTION PER CENT
Jaschke ²⁵	9.5
Pritzi ¹⁷	10.2
Lehoczky-Semmelweis ⁵²	9.4
Martin and Spieckhoff ³²	3.7

Such figures, taken as a whole, largely destroy the argument that cesarean section, as it is commonly employed, is a life-saving procedure for the child. Undoubtedly, this failure is due to lack of appreciation of proper indications for the operation, and of the possibilities of vaginal delivery. The desire to "do something" in the face of obstetric complications leads to many errors of judgment. It is largely among the "fetal" indications for the operation that the infant deaths occur.

The fetal mortality obviously depends upon the indication for which the section is done. Greenhill,⁵⁰ Holland,⁶² and Gordon⁵⁹ report comparable figures, see Table XXVI.

TABLE XXVI. FETAL MORTALITY DEPENDING UPON INDICATION

(GREENHILL) ⁵⁰		
INDICATION FOR OPERATION	INFANT MORTALITY PER CENT	
Disproportion	3.3	
Eclampsia	0.0	
Placenta previa	23.8	
Abruptio placentae	35.7	

INDICATION	HOLLAND ⁶²	GORDON ⁵⁹
	INFANT MORTALITY PER CENT	INFANT MORTALITY PER CENT
Contracted pelvis	8.1	1.9
Eclampsia and other toxemias	46.9	21.9
Antepartum hemorrhage	47.8	25.6
Other indications	21.8	8.4

DISCUSSION

The marked increase in forceps deliveries in this country is accounted for largely by the performance of "convenience" operations. Although they have been dignified by the name "prophylactic forceps" there is no good evidence that they prevent anything but loss of time on the part of the operator. To quote Eden,⁶⁵ "I doubt very much whether this is a prophylactic procedure. . . ." It is admitted that, in expert hands and amid proper hospital surroundings, the risk attached to the "convenience" low forceps is only slightly increased for the mother or child, but the practice has spread rapidly to those who do not have the proper training or adequate facilities, to the detriment of our general infant and maternal mortality records, thus substantiating the fears expressed in 1920 by Eden:⁶⁵ "We ought to make the conduct of normal labor as simple a matter as possible, because it will be from the standpoint of the country at large in the hands of comparatively unskilled men, and the harm which may be done by meddlesome midwifery, although the operation is designed to correct it, may in a few years become widespread."

Frequent reiteration of the necessity for aseptic technic and for adequate facilities and assistance does little to discourage general practitioners from following the spoken and written words of authorities who do almost routine operative deliveries. What is needed is a return to the idea that parturition is essentially a physiologic phenomenon, which should be interfered with only for good reason. The public should be educated to the fact that frequently a spontaneous delivery calls for more knowledge, skill, and judgment than does operative intervention, and that such services should be remunerated accordingly. Radicalism has so permeated the rank and file of physicians that appeals to them, even on the basis of established fact, can hope to accomplish results too slowly. There is perhaps some little evidence of a reaction toward conservatism but it will take years for

the pendulum to swing to a middle position where recent advances in operative technic can demonstrate their complete usefulness.

Organizations attempting to establish fee scales for medical services should be made to recognize the ridiculousness of certain provisions which have been popularized. The establishment of a higher fee for dilatation and curettage than for a spontaneous delivery is a case in point. And official sanction for a fee for forceps or version twice as high as for normal labor surely leads to temptation. There are certain advantages to a standard fee for delivery, irrespective of the need for operative intervention, although such an arrangement would be decidedly unpopular with the profession.

The increased use of cesarean section is merely part of the modern operative furor, but from the standpoint of maternal mortality probably the most important, since by conservative estimate the death rate is between 5 and 10 per cent. Assuming the actual incidence of the operation to be 1 per cent in the country as a whole, and the total number of deliveries in the United States to be 2,500,000, 25,000 cesarean sections would be done in the space of one year. If Tiber's⁴⁹ incidence of 0.26 per cent represents the limit of conservatism, then three-fourths of the usual number of operations are more or less unnecessary, entailing a death list of from 900 to 1,800 per year. Two and one-half million births with a total mortality of 70 per 10,000 represent 17,500 deaths from puerperal causes, one-third of which occur before the period of viability, leaving 11,700 as the probable toll taken by delivery as opposed to early misecarriage. The saving that might be expected from a diminished cesarean section incidence would represent at least 10 per cent of this loss, and would result in bringing our national maternal death rate down more nearly to that of other countries where vaginal delivery is more common and where the physiologic character of labor is better appreciated.

There is little hope that this national operative furor will wear itself out quickly, but it may be that wide dissemination of the general principles underlying the relatively safe performance of obstetric operations can effect some improvement. The danger of routine forceps can be minimized by careful attention to asepsis, while as regards cesarean section emphasis must be placed upon the early performance of the operation as an elective procedure. It should, moreover, be stressed that abdominal delivery has little place in the treatment of eclampsia, and that conservative medical care has actually established itself as the treatment of choice.

But for permanent and lasting relief, a return to first principles is necessary, it should be taught that any interference with normal labor carries a definite risk. This educational program should be carried to the medical profession at large, but especially to the laity, who after all largely determine the character of medical practice.

For my closing paragraph let me go back almost a century to Joseph Warrington's *Obstetric Catechism*, published in 1842, where the question is asked,

"What influence is the practitioner to exert in normal labor?" and the answer given,

"A negative influence, rather to prevent mischief than by being himself very active."

And to Elizabeth Nihill's *A Treatise on the Art of Midwifery*, published in London, 1760, from which is taken the following quotation:

"In this, they are some of them but too near upon a level with the man-midwife, with this difference, however, in favour of the female practitioners, that they are incapable of doing so much mischief as the male ones, oftenest more ignorant than themselves, but who with less tenderness and more rashness go to work with their instruments."

REFERENCES

- (1) Mortality Statistics, U. S. Bureau of Census (data supplied by Children's Bureau, Dec. 17, 1930).
- (2) Health News, N. Y. State Dept. Health 7: 206, 1930.
- (3) Frankel, L. K.: Am. J. Public Health 17: 1209, 1927.
- (4) Rodda, F. C.: J. A. M. A. 75: 452, 1920.
- (5) Bolt, R. A.: Causes and Prevention of Neonatal Mortality, Children's Bureau, p. 11, 1929.
- (6) Fahlbusch, O.: Zentralbl. f. Gynäk. 52: 1701, 1928.
- (7) Children's Bureau, unpublished statistics covering maternal deaths in 13 states for 1927 and 15 states for 1928.
- (8) Calvert, C. J.: Wisconsin M. J. 29: 65, 1930.
- (9) Boston M. & S. J. 188: 289, 1923.
- (10) Little, H. M.: Trans. Am. Assoc. Obst. Gynec. & Abd. Surg. 41: 259, 1928.
- (11) Bill, A. H.: Ibid. p. 261.
- (12) Ehrenfest, H.: Birth Injuries of the Child. Ed. 2, New York, D. Appleton and Co., 1931, p. 84.
- (13) Esch, P.: Monatsschr. f. Geburtsh. u. Gynäk. 69: 308, 1925.
- (14) Personal observation of the author.
- (15) Ehrenfest, H.: Loc. cit., p. 117.
- (16) Heinlein: Quoted by Ehrenfest, loc. cit., p. 141.
- (17) Pritzi, O.: Arch. f. Gynäk. 129: 592, 1927.
- (18) Thurn-Rumbach, S.: Zentralbl. f. Gynäk. 50: 462, 1926.
- (19) Santner, A.: Monatsschr. f. Geburtsh. u. Gynäk. 62: 289, 1923.
- (20) Questionnaire sent out by the Committee on Prenatal and Maternal Care of the White House Conference on Child Health and Protection.
- (21) Miller, J. R.: Personal communication.
- (22) Standard Birth Certificates modified for use in the State of Iowa by the addition of three questions, one of which is: Character of delivery? Spontaneous? Operative? If operative, name type of operation performed.
- (23) Questionnaire submitted to physicians in Iowa asking for data upon the method of delivery in their own private obstetric patients. Answered by 70 physicians.
- (24) Tottenham, R. E.: Clinical report of the Tsan Yuk Hospital and of the Maternity Bungalow, Government Civil Hospital, Hong Kong, for the year ending April, 1928.
- (25) Jaschke, R. T.: Klin. Wehnschr. 8: 1985, 1929.
- (26) Klaffen, E., and Bodnar, L.: Arch. f. Gynäk. 127: 528, 1926.
- (27) Schoeneck, H. W.: Trans. Am. Assoc. Obst. Gynec. & Abd. Surg. 41: 294, 1928.
- (28) Peterson, R.: Personal communication.
- (29) Stander, H. J.: Bull. Johns Hopkins Hosp. 47: 323, 1930.
- (30) Duncan, J. W.: Am. J. OBST. & GYNEC. 20: 225, 1930.
- (31) King, E. L.: Personal communication.
- (32) Martin, E., and Spieckhoff, K.: Monatsschr. f. Geburtsh. u. Gynäk. 81: 154, 1929.
- (33) Neumann, B.: Ztschr. f. Geburtsh. u. Gynäk. 90: 320, 1926.
- (34) Maternal Mortality. U. S. Department of Labor, Children's Bureau, Publication No. 158, p. 31, 1926.
- (35) Wetterdal, P.: Acta Obst. & Gynec. Scandinav. 6: 349, 1927.
- (36) Ehrenfest, H.: Loc. cit., p. 65.
- (37) Carroll, H. S.: Trans. Am. Assoc. Obst. Gynec. & Abd. Surg. 41: 286, 1928.
- (38) Gauss, C. J.: Zentralbl. f. Gynäk. 53: 1154, 1929.
- (39) Baisch: Quoted by Ehrenfest, loc. cit., p. 137.
- (40) Welz, W. E.: Am. J. OBST. & GYNEC. 13: 361, 1927.
- (41) Miller, J. R.: New England J. Med. 199: 651, 1928.
- (42) New Orleans M. & S. J. 79: 815, 1927.
- (43) DeNormandie, R. L.: Boston M. & S. J. 189: 1011, 1923.
- (44) Ilkevich, Selicky, and Levy: Am. J. OBST. & GYNEC. 19: 450, 1930.
- (45) Thompson, W. B.: Am. J. OBST. & GYNEC. 19: 392, 1930.
- (46) Ronsheim, J., and Daichman, I.: Am. J. OBST. & GYNEC. 20: 816, 1930.
- (47) Sage, E. C.: Nebraska

State M. J. 13: 328, 1928. (48) *Smith, D. L.*: Personal communication. (49) *Tiber, L. J.*: Personal communication. (50) *Greenhill, J. P.*: AM. J. OBST. & GYNEC. 19: 613, 1930. (51) *Winter, G.*: Zentralbl. f. Gynäk. 53: 1874, 1929. (52) *Lechozky-Semmelweis, K.*: Arch. f. Gynäk. 127: 237, 1925. (53) *Hirsch, M.*: Zentralbl. f. Gynäk. 52: 1377, 1928. (54) *Wille, F. C.*: Monatschr. f. Geburtsh. u. Gynäk. 73: 219, 1926. (55) *Kosmak, G. W.*: J. A. M. A. 89: 2009, 1927. (56) *Essen-Möller, E.*: Brit. M. J. 2: 843, 1929. (57) *Paine, A. R.*: New England J. M. 201: 445, 1929. (58) *Hellmuth, K.*: München. med. Wchnschr. 76: 737, 1929. (59) *Gordon, C. A.*: AM. J. OBST. & GYNEC. 16: 307, 1928. (60) *King, E. L.*: Personal communication. (61) *Quigley, J. K.*: Trans. Am. Assoc. Obst. Gynec. & Abd. Surg. 41: 180, 1928. (62) *Holland, E.*: J. Obst. & Gynec., Brit. Emp. 28: 358, 1921. (63) *Davis, N.*: Texas State J. Med. 24: 833, 1929. (64) *Williams, J. W.*: Obstetrics. Ed. 6, New York, 1930, D. Appleton and Co., p. 552. (65) *Eden, T. W.*: AM. J. OBST. & GYNEC. 1: 77, 1920.

SPERM MORPHOLOGY IN RELATION TO FERTILITY*

By G. L. MOENCH, M.D., F.A.C.S., *Associate Professor of Gynecology,*
AND HELEN HOLT, B.S., *Special Assistant in Research,*
NEW YORK, N. Y.

(From the Department of Gynecology and the Department of Pathology and Bacteriology of the New York Post-Graduate Medical School and Hospital)

INTRODUCTION

IT IS rather unfortunate that the huge and many sided problem of fertility has so often been attacked only from its most abnormal aspect, namely sterility. Diminished fertility of insufficient degree to prevent the possibility of begetting offspring has received scant attention, and thus sterility has not infrequently been set up as an abnormality, separate and apart, and opposed to fertility. As a matter of fact, actual sterility, that is, the utter inability of having issue, is generally a rather simple condition, associated with more or less gross defects. What is so commonly described as sterility, on the other hand, is often only lowered fertility. The latter is naturally a graded abnormality which with normal fertility as its starting point progresses steadily downward until finally such a low plane of fecundity is reached that clinical sterility is present.

In the female the disturbances of fertility have been fairly well studied, whereas often the only requirement the man had to meet was that of producing motile sperms.

For years I have felt that the examinations made to determine male fertility were entirely inadequate, and that the presence of motile sperms did not constitute a satisfactory proof of the fertility of the husband. It always seemed to me that the morphology of the sperms should also be considered. The present work represents the results of such a morphologic study.

*Work done under a grant from the Committee of Maternal Health of New York City. A complete report with tables, graphs, biometrical results, and case histories has appeared as a Beilage to the Ztschr. f. Geburtsh. u. Gynäk. 99.

GENERAL CONSIDERATIONS

In some earlier, preliminary articles^{1, 2, 3, 4} I considered some of the aspects of obscure cases of lowered or absent fertility and called attention to the apparent relation of sperm-head morphology and biometrics to fertility. The present article is a continuation and seemingly a confirmation of the previous work. Up to date, at least, I have no reason to change any of the views expressed in previous writings on the subject, although many points now call for amplification.

In attempting to determine male fertility one is faced with the identical but reverse problem which confronts one in attempting to determine the ability of the female to bear offspring. For the same reasons that an infertile union requires not only a thorough examination of the wife, but also of the husband, we had to examine as carefully and fully as possible the woman as well as the man, even though our main object was to attempt to gain knowledge regarding male fertility.

The present work is based on a study of 141 couples from the clinic and private practice varying in age in the woman from eighteen to forty-one, and in the man from twenty-two to forty-eight years of age. Of the total number, 37 cases were considered normal, 63 were sterile, and 41 intermediate. The average age in these three groups did not differ significantly. The so-called intermediate group comprises those cases in which the wife conceived only with difficulty or failed to conceive again, despite her wish for more children, or where spontaneous abortions or premature or abnormal children were a dominating feature. This group also includes some cases which are doubtful because the obtained data were not reliable, or because the fertility of both partners was impaired.

The 37 normal couples together had 94 children, no stillbirths, no premature labors, 5 accidental or traumatic abortions, 25 induced abortions, and 4 spontaneous abortions. Two of the latter still may have been induced as the women made conflicting statements at different times. The third and fourth abortions were apparently genuinely spontaneous, but since the woman in one case had had eight other normal pregnancies, and in the other case 13 more normal pregnancies, we felt that the occurrence of one spontaneous abortion did not prevent these two women from being considered normal. The small number of spontaneous abortions is of course accounted for by the fact that with the exceptions just mentioned we did not put the woman into the normal group if she had had spontaneous abortions.

The 41 intermediate cases had 33 normal children, 2 abnormal children, 7 stillbirths at term, 5 prematurely born stillbirths, 11 induced abortions, 4 traumatic abortions, and 49 spontaneous abortions.

In Table I we see that in 41 cases which were not sterile, but whose fertility was impaired in some way, the woman was otherwise normal as far as we could determine 26 times, had a severe endocervicitis 4

times, and adnexal disease 7 times. Of the latter cases, 5 were insufflated and found to have closed tubes, and two were not subjected to this procedure because their adnexal lesions were too acute. Two other women out of these 41 had an uncomplicated retroversion which we do not consider a sufficient explanation for sterility.

Four patients had a small uterus. In only one of these, however, could the uterus be considered so highly hypoplastic as to have any bearing on the lowered fertility. Three women had an endocrine dysfunction as indicated by irregular and scanty menstruation, obesity, and in one case increased growth of body hair. Some of the women in this group had more than one abnormality, so that the total number of defects in the above cited cases will add up to more than the actual number of patients.

Of the 63 sterile unions, the women were normal 24 times, had cervicitis four times, adnexal disease with closed tubes 14 times, a markedly underdeveloped uterus 8 times, an uncomplicated retroversion twice, an endocrine dysfunction 9 times, and were generally below par physically in two instances.

Naturally there were among all these patients actually more cases of cervicitis and small uterus than are tabulated here, but we included here only those lesions which might play a rôle in impairing the fertility. Furthermore, I preferred to be over-particular in placing the onus of an otherwise obscure case of sterility on the female rather than to explain such infertility by a slight abnormality of the woman just because it would fit well into our statistical results.

In the case of the men, 16 (of the 41 unions showing impaired fertility) were normal according to our standards, which will be given in detail later on. Twelve were definitely abnormal, and 13 were borderline cases.

In the 63 sterile matings the men were normal 21 times, abnormal 37 times, and borderline or doubtful cases 5 times. Ten of the 63 men had no spermatozoa at all, and all of these cases gave a history of gonorrheal infection with bilateral epididymitis.

Tables I and II show the various figures, given so far, more clearly.

Of the 104 cases of impaired or lost fertility, the women thus were normal in 49 cases, and the men in 37. In 9 instances both partners showed at least impaired fertility. On the other hand, in 8 of these 104 marriages nothing could be found wrong with either partner. In four of these cases, however, only the man could be examined, but the wife was said to be normal. The various figures as given here have perhaps some interest in connection with the work of other authors.⁵⁻¹⁶ They must, however, not be given too much value, since first of all our series is very small, and in addition the cases are not quite random samples, but in some instances hand-picked to suit our particular purpose.

TABLE I. PHYSICAL FINDINGS IN THE WOMEN

	TOTAL NUMBER OF CASES	NORMAL	ENDO- CERVICITIS	ADNEXAL DISEASE	RETROFLEX- ION OF UTERUS	SMALL UTERUS	ENDOCRINE DISTURBANCE	PHYSICALLY BELOW PAR
Cases of impaired fertility	41	25	4	7	2	4	3	-
Cases of sterility	63	24	4	14	2	8	9	2

TABLE II. RESULTS OF THE SEMEN EXAMINATION IN THE MEN

	TOTAL NUMBER OF CASES	NORMAL	POOR	FAIR	NO SPERMA AT ALL
Cases of impaired fertility	41	16	12	13	-
Cases of sterility	63	21	27	5	10

In Table I the figures in the various columns added together total more than the numbers in the first column since some of the women had more than one lesion.

THE EXAMINATION OF THE WOMAN AND THE MAN

In order not to be subjectively influenced we examined the husband's semen first, and after this examination had been completed, an examination of the patients was carried out along the lines already laid down in previous articles.⁴

MORPHOLOGY OF THE SPERMATOZOA

In examining the semen and its morphology, a complete examination of the semen, both grossly and microscopically, was of course made (see Moench and Holt,^{4b} and Moench^{4m}). The morphology of the spermatozoa has been gone into by various observers (Ballowitz,¹⁷ Cary,¹⁸ Huhner,¹¹ Gilman,¹⁹ etc.), but almost invariably the conclusions drawn from a morphologic study of this kind are as Huhner expressed it "that if a sufficient number of normal actively motile sperms are present in a semen specimen, the presence of the abnormal sperm cells does not interfere with its potency." *To this we cannot subscribe. On the contrary, we found that the sperm head is the greatest single source of information as to the fitness of these cells for reproduction, and that, in average cases, the relative number of abnormal sperm heads affords an index to the reproductive fitness of the individual. This must mean that a disturbance of spermatogenesis is present which affects all the sperm cells, but that only the more grossly deformed ones are visible, because our microscope is too crude an instrument to detect slighter changes.*

After satisfactory smears had been obtained and stained, normal and abnormal sperm forms were counted and tabulated under precautions already described (Moench^{4m}). Fig. 1 illustrates some of the abnormal forms seen by us.

It is practically self-evident that a simple, more or less mechanical, tabulation of the various sperm abnormalities will not directly answer the question of how good or bad any given sample of semen was. The various abnormalities have not all the same importance. The final evaluation of any semen from the standpoint of morphology can therefore only be made by taking all the vital points into consideration. It thus became extremely important to recognize the weight and value of the various abnormal forms encountered.

Head Changes.—Abnormalities of the sperm head are by far the most important changes, much more so than the body changes or any other aberrant forms, or even the total number of abnormal spermatozoa present. This is brought out clearly by Tables III and IV. Table III shows the head changes consistently low (below 200 per thousand) in the normal group and those sterile cases where the woman was definitely abnormal, and high (above 250 per thousand), in that group where the woman was normal. The total number of abnormal sperms

TABLE III. TABULATION OF SPERM CELL CHANGES PER 1000 OBSERVED IN 36 RANDOM CASES, 12 OF WHICH HAD A NORMAL AND 24 AN ABNORMAL BREEDING RECORD. IN 12 OF THE LATTER 24 CASES THE WOMAN WAS NORMAL AND IN 12 DEFINITELY ABNORMAL

	CASE NUMBER	TOTAL CHANGES	HEAD CHANGES	TOTAL CHANGES MINUS HEAD CHANGES	TOTAL BODY CHANGES
<i>Clinically Normal Cases</i>					
1	92	361	193	168	101
2	81	304	111	193	104
3	40	233	170	63	62
4	58	150	94	56	32
5	17	302	151	151	147
6	18	424	133	291	102
7	28	270	154	116	21
8	71	362	136	226	124
9	102	176	125	51	37
10	59	339	122	217	83
11	128	372	182	190	106
12	37	194	123	71	45
<i>Sterile Cases—Woman Abnormal</i>					
1	38	203	151	52	42
2	110	343	124	219	72
3	101	282	125	157	29
4	124	321	193	128	60
5	36	274	162	112	95
6	13	296	171	125	100
7	129	221	113	108	55
8	69	272	134	138	78
9	25	403	102	301	140
10	127	334	141	193	49
11	100	223	133	90	53
12	114	291	124	167	60
<i>Sterile Cases—Woman Normal</i>					
1	7	352	271	81	90
2	61	443	294	149	78
3	11	292	262	30	43
4	140	581	343	238	106
5	32	514	261	253	90
6	23	511	364	147	84
7	139	653	291	362	157
8	39	372	273	99	60
9	126	516	274	242	134
10	73	464	242	222	82
11	78	360	244	116	86
12	63	481	322	159	83

observed however shows no relation to the clinical fertility record, except as it is increased by the higher abnormal head count. The body changes also cannot be correlated with the clinical fertility (Table IV).

We did not deem it necessary to reproduce here a tabulation of this sort for all our cases, since they all ran about the same, and these 36 cases may serve as examples.

That body changes are not very important does not agree with the opinion originally held by Williams and Savage,²⁰⁻²⁹ since these investigators believed that body changes are even more important than

TABLE IV. BODY AND OTHER CELL CHANGES PER 1000 (EXCEPT HEAD CHANGES) IN SAME CASES AS TABLE III

BODY CHANGES						OTHER ABNORMALITIES			
CASE NO.	TOTAL BODY CHANGES	CYTOPLASMIC EXTRUSIONS	NAKED BODY FIBRILS	THICKENED BODIES	COILED TAILS	UNDEVELOPED CELLS	DOUBLE FORMS	MISCELLANEOUS	
Clinically Normal Cases									
1	92	101	18	33	50	28	3	33	
2	81	104	27	7	70	30	13	37	
3	40	62	4	9	49	16	4	14	
4	58	32	6	2	24	14	6	6	
5	17	147	0	37	110	53	20	3	
6	18	102	15	0	87	175	25	0	
7	28	21	2	17	2	30	38	32	
8	71	124	16	36	72	54	16	72	
9	102	37	17	3	17	20	0	10	
10	59	83	7	23	53	107	10	10	
11	128	106	2	20	84	66	0	18	
12	37	45	8	6	31	51	6	3	
Sterile Cases—Woman Abnormal									
1	38	42	4	14	24	4	2	2	
2	110	72	12	10	50	130	15	7	
3	101	29	2	9	18	118	12	4	
4	124	60	7	12	41	31	17	17	
5	36	95	16	6	73	11	5	5	
6	13	100	24	8	68	16	8	4	
7	129	55	5	8	42	35	5	15	
8	69	78	5	18	55	33	13	15	
9	25	140	10	77	53	90	40	7	
10	127	49	8	8	33	100	15	30	
11	100	53	10	3	40	23	20	10	
12	114	60	12	24	24	88	16	10	
Sterile Cases—Woman Normal									
1	7	90	0	7	83	10	10	0	
2	61	78	16	10	52	38	14	6	
3	11	43	20	3	20	0	0	10	
4	140	106	33	0	73	33	20	80	
5	32	90	0	50	40	112	42	4	
6	23	84	8	24	52	28	56	24	
7	139	157	17	40	100	143	37	27	
8	39	60	0	7	53	17	3	17	
9	126	134	19	36	79	46	21	34	
10	73	82	10	22	50	78	45	18	
11	78	86	13	16	57	11	2	23	
12	63	83	8	18	57	53	12	15	
Thickened end ring 1 in 300									
Thickened end ring 5 in 500									
Thickened end ring 1 in 500 Abaxial 3 in 250									
Abaxial 1 in 300 Thickened end ring 2 in 700									

head changes. This disagreement is, however, easily explained. In the bull, body changes are uncommon. As a result, they are observed principally only in really bad samples of semen and for this reason naturally seemed to have great significance. On the other hand, in

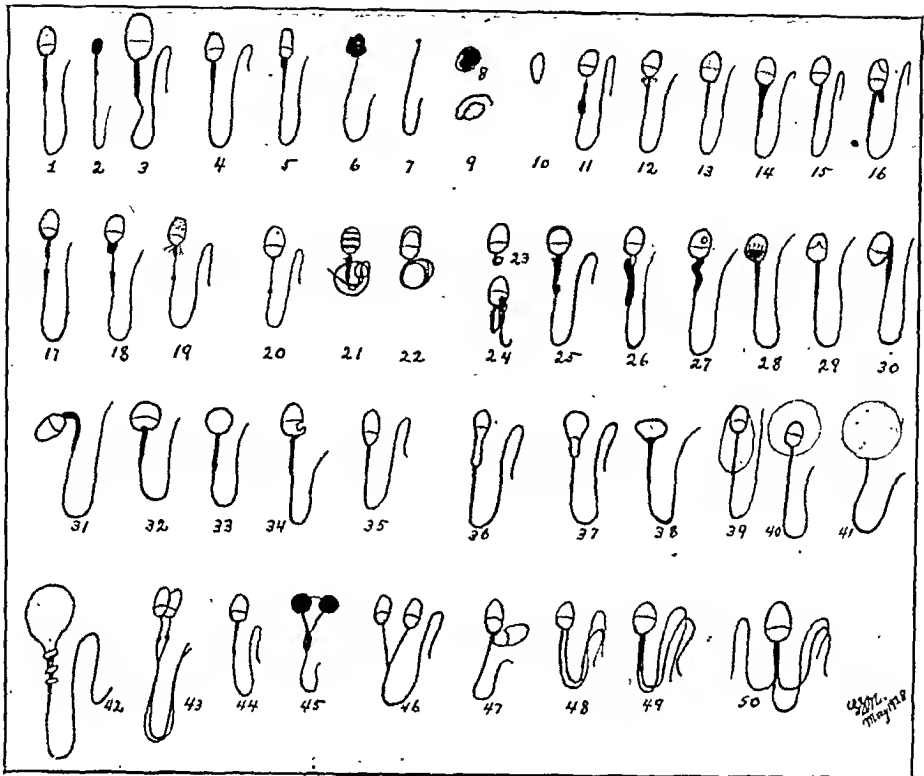


Fig. 1.—1, Normal spermatozoon. 2, Microsperm. 3, Megalosperm. End fibril of tail well pronounced in this specimen. 4, Roughened head membrane. 5, Narrow cell with spheroidal swelling of body. 6, Irregularly solid staining head and absence of body. 7, Aplastic head and absence of body. Such cells have been seen motile. 8, Arrested development of germ cell—tail tightly coiled about head; head solid staining. 9, Arrested development of tail. 10, Phantom cell, takes almost no stain; head tapers posteriorly, due to lack of division of end knobs; no body or tail. 11, Filiform middle piece and spheroidal swelling of posterior end of body. 12, Cytoplasmic extrusion; pseudo-swelling of head. 13, Overdevelopment of end knobs; posterior end of head square. 14, Body tapers, broader anteriorly—form of cytoplasmic extrusion. Of no clinical significance. 15, Abaxial implantation of body and tail. 16, Abaxial implantation of body and tail. Cell originally double bodied and stump of second body still present. Oblique tear or separation of head membrane. 17, Separation of body (probably artefact). Reverse staining of head, anterior portion darkest. The thick line running along the base of the head is found at times. Whether it represents an overdeveloped end knob or a remnant of the blepharoblast (cf. Bowen¹⁵¹) or cytoplasm is somewhat in doubt but from our microdissection studies we tend to the last possibility. 18, Separation of body; perhaps the thickening in the anterior portion is due to a drawing up of the body by the elastic fibrils present here, or the anterior or posterior end knob or both end knobs may be overdeveloped. 19, Short fibrils seen around abnormal body. Elastic fibrils? Thickened end ring. The cell head also shows fine stippling which is occasionally met with. It apparently indicates a beginning degeneration of the head covering. See also 21, 28, and 29. 20, Thickened end knob and end ring. Naked body fibril. 21, Coiled tail which is of no significance and undoubtedly an artefact. In addition we have here cross lines on the head which are not to be confused with Valentine's cross bands and represent either artefacts or degeneration. This cell also shows a narrowed neck which probably does not represent a separation of the anterior or posterior end knobs, as I have seen this picture especially in slides not made by myself and more or less roughly handled. 22, Cell with coiled tail, may be an artefact or may be an actual change in the cell. At any rate, it is a late change and of relatively little significance. Such cells have been seen motile, although their motility is of necessity limited. In addition this cell head shows an apparent head cap but whether this is really a head cap such as is found in the case of the guinea pig or a separation of the head membrane is still under investigation. 23, Coiled undeveloped tail. This is important as the cell has nothing to propel it. 24, Tail folded up, artefact. 25, This cell shows a nick in the body and a little piece similar in size and shape, but upside down, attached to the opposite side of the body. It would seem as if this body had been tightly coiled and in straightening out had torn a piece out of the body. Williams and Savage¹⁷⁹ have seen some specimens of semen from the bull in which a fair number of the cells showed such a nick in the body with a small piece similar in size and shape to the nick, attached to the tail of the cell. Cell 25 also shows the thickening of the anterior head membrane seen in some cells. 26, This probably represents a splitting loose of the sheath of the body. 27, Crooked thickened body. In the head a little refracting area whose significance is unknown. Polar body? Centrosome? Plasmosome? Artefact? 28, Several dark areas at the demarcation of the light and dark areas of the head. Rents in the head capsule? 29, Apparently a splitting of the capsule. 30 and 31, These forms are not artefacts. They have been seen motile in the fresh specimen, and do not straighten

man body changes are quite common, being frequent even in good semen as shown by our tables. On the basis of our investigations of the sperm body changes in man, Williams and Savage have gone over their cases again and now agree with us that body changes, alone, unless present in really large numbers, are less significant than head changes.

All head changes (see Fig. 1) are, however, as can be readily appreciated, also not of equal importance. A slight narrowing of the head, for instance, unless present in most of the cells, usually is of relatively little significance. Somewhat rounded heads are also to be considered normal. Really round heads were counted by us as abnormal, but whether or not they are important is still undetermined, because they never are present in large enough numbers to allow of their proper evaluation.

Distinctly large round cells are probably more or less immature or degenerated cells and distinctly of importance, but are also never seen in sufficiently large numbers to allow of statistical correlation with any clinical abnormalities. As a matter of fact, generally large cells seem not infrequently to have a definite tendency to a double form, and Lespinasse³⁰ has seen such cell forms and double forms as the result of the exposure of the gonads to radiant energy (see also Painter³¹).

Distinctly narrow cells, and rounded cells tapering at the base are extremely important and in themselves represent probably the most sinister morphologic change of the sperm head, as far as fertilizing power is concerned. In such narrowed and tapering cells the nuclear material of the head is necessarily reduced, thus probably impairing the value of the cell. Aside from this, however, the base of the head where the chromosomes of the spermatozoon are situated, becomes involved.

out. They often move sideways, backwards, or in circles (see text). 32, Rounded cell head with overdeveloped anterior end knob. Moderately rounded heads are probably normal variations and of no clinical significance unless they show other abnormalities as in cell 33, where staining reaction is abnormal and the cell therefore probably inferior. 34, Cell head with apparently a piece of the cell membrane of the base broken out. Due to trauma? 35, Frequently seen form of tapering head. Significant when present in large numbers in any one sample of semen. 36, Exaggerated narrow and tapering cell with spheroidal swelling around base; overdeveloped end knobs? This form of head must be separated from spheroidal swellings of the cell body in this region. 37, Tapering cell, nuclear material diminished. These cells easily separate from the body. 38, Extreme form of tapering cell. 39, Immature cell, cytoplasm of cell not cast off; no body. Nucleus (sperm head) has moved to anterior portion of cell. Such cells are occasionally seen, as also cell 40, which likewise represents an immature cell which has failed to cast off its cytoplasm, the nucleus (head) not even having moved to the anterior portion of the cell. 41, Puff ball type of cell, contour washed out; short tail; no body. This form of cell, representing an immature abnormally developed cell, has been seen in the fresh specimen, but often is an artefact and produced by allowing the cells to dry slowly in a moist heat. Rapid drying in the flame will prevent such puffing or disintegration of the cells. 42, Large immature cell-spiral fibers about the body, or cytoplasmic discs? 43, Double form showing in each cell the same abnormalities, namely a narrow head, naked body fibril, and thickened end ring. Double forms are at times only apparent or artefacts, but in other cases double forms are actually present, especially the megalosperms showing a tendency to double bodies and tails. Even two separate sperms stuck together must have a significance since they frequently, as in this case, show the same abnormalities, indicating disturbed spermatogenesis and lack of complete separation (see also text). 44, Double neck. 45, Double sperm, immature, spermatid veil over and between heads, swelling of body. 46, Double head and body. 47, Double heads, one almost without body. 48, Single head, double body and tail. 49, Single head, single thickened body, double tail. 50, Single head, single thickened body, triple tail.

As far as the size of the sperm heads is concerned, we can say that all cells from one ejaculate should be more or less of the same size. Reasonable differences, however, must be allowed for, and only definitely marked variations in size which usually concern the longitudinal axis of the head should be counted as abnormal.

Some of the other abnormalities of the head which were found are shown in Fig. 1 and explained by the legend, so that further detailed discussion of these cells is unnecessary here.

Abnormalities of the Sperm Bodies.—The body, or middle, or connecting piece of the spermatozoon undergoes often, in man at least, slight or pronounced changes. In rare instances the body is missing entirely.

Sometimes the body is partially absent, so that instead of the normal, fairly thick middle piece we get only a thread-like structure which connects the head to the tail. (Fig. 1, cells 11, 17, 18, 19, 20, and 43.)

Swelling of the middle piece, instead of thinning, as seen in the condition just described, is extremely common in the human spermatozoon. There are, however, three different conditions to be distinguished here, see Fig. 1, cells 36, 5, 11, 32, and 12, and legends. See here Savage,^{28, 29} W. L. Williams,³² Piersol,³³ and Bailey and Miller.³⁴

Thickened and Double Bodies.—Thickened and double bodies are also present in the human semen. A number of cells in Fig. 1 show thickened bodies. Various forms of doubling occur, and may be more or less complete, due to incomplete division during the course of spermatogenesis. The double cell forms are rarely frequent, seldom constituting more than 1 or 2 per cent of the total number of sperm cells present. It is interesting in this connection that in Case 95 where the breeding record was decidedly bad, and fetal malformations repeatedly occurred, the man had almost 12 per cent double forms.

A fairly common abnormality was a bending or curving of the body on its longitudinal axis. This has been described at times as a sign of gradual dying of the cell, but we have seen it also in motile sperms in perfectly fresh specimens (cells 30 and 31, and legend to these figures).

Tails.—At times the whole tail is absent and only a free head seen. This may be an artefact, but in other cases must have significance, since free heads, but no free tails, are seen in fresh specimens. Especially tapering heads seem to be easily afflicted with a loss of the tail which, by the way, is always associated with the loss of the body, as the tails do not break off except due to excessive trauma at the posterior end of the body.

Coiled Bodies and Tails.—Fig. 1 and the legend describe this subject sufficiently. (See here Moench⁴³ and Chambers.^{35, 36, 37})

It might be thought, perhaps, that some of the cell forms observed represent artefacts or at least variable factors. That this is not so has been shown in previous articles (Moench^{3, 4b, 4d, 4h, 4i, 4j, 4k, 4l, 4m}).

Under ordinary conditions the morphology of any semen sample remains remarkably constant, specimen after specimen, even with varying frequency of intercourse, showing exactly the same results in the tabulation of the cytology. In fact, unless the patient from whom the semen was obtained was afflicted by an intervening sickness or other change in physical health, the semen specimen could be said almost to have that particular patient's trademark on it. In one instance, one of us, knowing nothing about the case, except that it was a reexamination, identified the man from whom the semen was obtained.

Moist heat, however, does affect the cells and causes a marked disturbance of the sperm heads, immediately recognizable. The cells become puffed, huge in size and foggy in outline, and often appear granular. This occurs especially in hot summer weather, and only while the cells are drying on the slide. By fixing the slide in the flame immediately while still moist the puffing of the cells can be prevented. Alcohol fixation also prevents its occurrence.

Since our various tests and microdissection studies showed us that the morphology of the sperm cells was constant, we felt that the sperm abnormalities observed under the microscope were really significant, and we therefore believed ourselves justified in making comparative studies of such variations in appearance of the individual spermatozoa.

We tabulated our results in a series of tables (not reproduced here), and found that the semen examinations in 37 marriages in which the breeding record was normal as far as we could determine averaged 142 abnormal heads per 1000, and were always below 200 per thousand. It was also found that no normal semen contained the especially sinister, tapering or narrow, sperm heads in a greater number than 76 per thousand. We considered the case normal if the wife had conceived quickly under natural conditions, had been normally pregnant recently, and had had no stillbirths, premature labors, or spontaneous abortions, with the two exceptions previously mentioned.

In 11 cases where the woman was clinically abnormal, and the couple not sterile, but of definitely impaired fertility, the sperm head changes averaged 158 per 1000. In one case here we had 221 abnormal sperm heads per 1000, but since we arranged all our cases only from the side of the woman, it is of course self-evident that an abnormal woman may be married to a sterile man.

In 29 cases where the woman was clinically abnormal and the couple sterile, the head changes averaged 165 per 1000 (the gradually increasing number of abnormal heads of course being explainable by the method of arranging our tables from the female side only, as mentioned. Naturally such an arrangement will produce some discrepancies, but we felt that the method employed would be the safest and perhaps least subject to personal factors).

On the other hand, in 30 cases where the woman was clinically normal and the couple was not sterile but had a poor breeding record, the head changes averaged 237 per 1000, and in 34 cases where the woman was also normal but the couple sterile, the head changes went up to 287 per 1000.

The total number of abnormal cells and the body changes or other cell variations never gave such decisive figures as the apparently all important sperm head abnormalities.

If then from our small series of cases we may be permitted to draw conclusions we would say:

1. In a normal semen the abnormal sperm heads do not exceed 19 to 20 per cent.
2. When the sperm head abnormalities reach 20 to 23 per cent, impaired fertility can be assumed.
3. When the sperm head abnormalities are above 25 per cent, clinical sterility is usually present.

REFERENCES

- (1) *Moench*: AM. J. OBST. & GYNEC. 13: 334, 1927. (2) *Idem*: M. J. & Rec. 126: 94, 1927. (3) *Idem*: M. Herald, March, 1928. (4a) *Idem*: M. Herald, October, 1929. (4b) *Moench and Holt*: M. Herald 49: 1, 1930. (4c) *Moench*: AM. J. OBST. & GYNEC. 16: 254, 1928. (4d) *Idem*: M. Times 57: 283, 1929. (4e) *Idem*: M. Herald, May, 1929. (4f) *Idem*: AM. J. OBST. & GYNEC. 19: 77, 1930. (4g) *Idem*: J. A. M. A. 94: 1204, 1930. (4h) *Idem*: J. A. M. A. 94: 479, 1930. (4i) *Moench and Holt*: Biol. Bull. 56: April, 1929. (4j) *Moench*: AM. J. OBST. & GYNEC. 18: 53, 1929. (4k) *Idem*: Urol. & Cutan. Rev. 33: 814, 1929. (4l) *Moench and Holt*: Biol. Bull. 57: 267, 1929. (4m) *Moench*: AM. J. OBST. & GYNEC. 19: 530, 1930. (5) *Dickinson*: AM. J. OBST. & GYNEC. 14: 590, 1927. (6) *Read*: N. Y. State J. Med. 24: 101, 1924. (7) *Cary*: AM. J. OBST. & GYNEC. 2: 406, 1921. (8) *Dickinson and Cary*: J. A. M. A., Spanish Ed. 7: No. 2. (9) *Frank*: Surg. Gynec. Obst. 45: 189, 1927. (10) *Giles*: Sterility in Women, Oxford University Press, 1919. (11) *Huhner*: Internat. J. Surg., March, 1921. (12) *Idem*: Sterility in the Male and Female, Rebman Co., N. Y., 1913. (13) *Idem*: Bull. N. Y. Acad. Med., 2nd Series 4: No. 1. (14) *Hunner and Wharton*: Southern M. J. 17: 269, 1924. (15) *Mayer, A.*: Monatschr. f. Geburtsh. & Gynäk. 75: 21, 1926. (16) *Schwarz*: Ibid. 71: 283, 1925. (17) *Ballowitz*: Sperma Handwörterb. d. Naturwiss., Vol. 9, Fischer, Jena, 1913. (18) *Cary*: Am. J. Obst. & Dis. Women & Children 74: 1916. (19) *Gilman*: Report of N. Y. State Vet. Coll., 1921, 1922. (20) *Williams, W. W.*: J. A. V. M. A. 11: 29, 1920. (21) *Williams, W. W.*: N. Am. Vet. 8: 26, 1927, and J. A. V. M. A. 70: March, 1927. (22) *Williams, W. W.*: Cornell Vet. 10: 1920. (23) *Williams, W. W.*: Ibid. 12: 1922. (24) *Williams and Savage*: Ibid., October, 1925. (25) *Williams and Savage*: Cornell Vet., p. 162, 1926. (26) *Idem*: Trans. Roy. Soc., Canada, Third Series 21: Section V, 1927. (27) *Idem*: J. A. V. M. A. 21: 462, 1926. (28) *Savage*: Sc. Agr. Ottawa 4: 1924. (29) *Idem*: J. A. V. M. A. 65: 708, 1924. (30) *Lespinasse*: J. A. M. A., Feb. 3, 1917. (31) *Painter*: J. Exper. Zool. 37: April 5, 1923. (32) *Williams, W. W.*: Cornell Vet. 13: 1923. (33) *Piersol*: Normal Histology, Philadelphia, 1910. (34) *Bailey and Miller*: Textbook of Embryology, ed. 2, New York, 1911. (35) *Chambers*: Science 40: 824, 1914. (36) *Idem*: Anat. Rec. 24: 1922, Reprinted J. Roy. Micr. Soc., December, 1922. (37) *Idem*: La Cellule. 35: No. 1, 1924.

URINARY TRACT INFECTIONS DURING PREGNANCY*

BY HAROLD L. MORRIS, M.D., F.A.C.S., AND LEO J. LANGLOIS, M.D.,
DETROIT, MICH.

URINARY tract infections during and after pregnancy, have received a great deal of attention in the past few years. Many papers have appeared especially as the result of urologic investigation, until at the present time the field is very well covered from the standpoint of etiology, diagnosis, and treatment of urinary tract infection in the course of the puerperium. However, we believe after our observations of the past few months, that sufficient emphasis has not been laid on this subject for all physicians to grasp the significance of, and institute adequate treatment for infections which may be so severe and damaging if unrecognized.

In the Out-Patient Department of the Woman's Hospital of Detroit, which admits only adult females, all new patients are catheterized. The specimen is given the usual chemical analysis and, in addition, cell counts and stained smears are made of all sediments. Those patients who have a pyuria, bacteriuria, hematuria or symptoms referable to the urinary tract are referred to the Urological Department for further observation. The result is that a large percentage of the new cases admitted, which include surgery, medicine, obstetrics, and gynecology, are investigated from a urologic viewpoint as most of these patients do have, or have had symptoms referable to the urinary tract.

During the first eight months of 1930, 505 new obstetric patients were admitted to the hospital. The frequency with which we found urinary tract symptoms in these pregnant patients led us to make some studies for the purpose of analysis and comparative observations of other investigators. As quite a few of the obstetric patients were young unmarried girls, our interest was aroused, and an explanation sought for the urinary tract symptoms manifested.

In our series of cases, there were 27 primipara and 31 multipara: 48 were antepartum and 10 were postpartum. Nineteen were completed cases, that is, those under observation from the early antepartum period to the cessation of their symptoms postpartum. The average age of the primiparous woman was twenty-two, as compared with the multiparous woman which was thirty. The average number of pregnancies among the multipara was 3.

We studied the symptomatology of these patients quite thoroughly and found the first symptom was frequency of urination. This oc-

*Read at the Seventh Annual Meeting of the North Central Branch, American Urological Association, Indianapolis, Ind., October 23, 1930.

curred in a greater percentage than any other symptom in each of the 4 groups. Next to urinary frequency, nocturia, smarting and burning, renal backache, and urgency, rank in the above order as regards frequency of occurrence. In those cases experiencing renal backache, 31.8 per cent complained of bilateral tenderness, while 22.7 per cent had unilateral renal pain. Of the unilateral group, 13.7 per cent had right kidney tenderness, as compared to 9 per cent with left kidney symptoms. This substantiates the findings of former investigators who found a greater percentage of right-sided renal infections. An average taken among this series of cases showed the above symptoms to begin at the fourth month. Chills and fever were found in a very high percentage of cases, especially in the postpartum group. These cases as a rule were acute, and seen by us in the hospital wards. Suprapubic pain was rather infrequent, occurring in 9 per cent of cases, and was generally experienced by patients suffering from a very severe cystitis or pyelitis. These cases responded satisfactorily to treatment.

Among the gastrointestinal symptoms, constipation ranked first in importance. This complaint, we think, was the most formidable of all, and at the same time the most rebellious toward treatment. It has been definitely proved by Francke that there is a direct communication between the lymphatics of the large bowel and those of the right kidney; and that there probably exists a similar situation on the left side. The importance of this fact can be readily appreciated since in pregnancy we know that there is a certain degree of urinary stasis in the kidney pelvis in most cases. The cause of this stasis, DeLee believes, is ureteral tortuosity, which is in turn due to hypertrophy and displacement of the pelvic organs. According to DeLee, a bacteriuria exists in a large percentage of healthy pregnant women due to constipation; thus an ideal situation is present for renal infection, because of poor renal drainage. This accounts, no doubt, for the high percentage of *B. coli* urinary infections found in pregnancy.

Nausea and vomiting occurred in 27.3 per cent of our cases. This symptom was usually a companion of chills and fever and was present mostly in the acute cases of pyelitis. Dyspepsia is another complaint listed with the gastrointestinal group. This term includes heartburn, epigastric distress, and gaseous eructations which proved to be secondary to other maladies as cholecystitis or gastric hyperacidity in most instances.

Under the term "miscellaneous" were grouped headache, vertigo and blurring of vision. Headache occurred in 34.62 per cent of cases and was associated in the great majority of instances with chronic upper respiratory infections or visual disturbances. In a certain number of patients, complaining of headache, vertigo, and blurring of vision, we were able to lay the blame on an elevated blood pressure, albuminuria or elevated nonprotein nitrogen retention. These symp-

toms have been illustrated in Table I, showing the percentage of occurrence for each symptom, in all 4 groups of patients.

TABLE I

			ANTEPARTUM		POSTPARTUM	
			PRIMIPARA PER CENT	MULTIPARA PER CENT	PRIMIPARA PER CENT	MULTIPARA PER CENT
Urinary symptoms	Frequency		63.2	46.1	100	80
	Smarting and burning		45.5	34.62	80	80
	Nocturia		58.8	38.4	40	60
	Edema of ankles		13.7	46.1	0	40
	Urgency		22.8	38.4	40	20
	Chills and fever		22.8	15.41	100	40
	Renal backache	Bilateral	31.8	23.11	0	20
		Right kidney	13.7	19.2	60	60
		Left kidney	9	0	20	0
	Hematuria		4.5	11.54	60	0
G. I. symptoms	Incontinence		0	15.41	0	0
	Suprapubic pain		9	7.7	0	0
	Nausea and vomiting		27.3	30.71	80	20
	Constipation		36.1	19.2	0	20
Miscella- neous	Dyspepsia		0	7.7	0	20
	Headache		27.1	34.62	40	0
	Vertigo		18.2	34.62	0	0
	Blurring of vision		4.59	23.11	0	0

Table II shows the presence of albumin, casts, pus, and the type of bacteria present in the urines of these patients. Positive tests for albumin and casts were infrequently seen, being found at the rate of 9 per cent and 4.5 per cent respectively. Practically 75 per cent of urines examined showed evidence of pus. Turbid urines, indicated in the chart by microscopic pus, were in excess of those specimens containing pus. *B. coli* infections were far more numerous than coccal types. The former were found in excess of the latter in the ratio of 4 to 1. This difference we believe can be accounted for by the presence of constipation. Several cases presented evidence of mixed infection. Approximately 30 per cent of our patients failed to show bacteria in the urine. Many specimens showed a bacterinuria in spite of clear looking urines, and conversely we were unable to demonstrate bacteria in several patients with turbid urines. This demonstrated the necessity of culturing all urines, and also examining a stained centrifuged sediment smear, before a final conclusion could be drawn. In several instances a report of "no growth on culture media," was proved spurious, when stained sediment smears of the same specimen showed many bacteria to be present. Our conclusions were that examination of sediment smears was far more reliable than cultures, although we always ordered cell counts, cultures, and smears on all urines.

In the cystoscopic examination of pregnant patients, one must remember that certain variations in the appearance of the mucosa and contour of the bladder are physiologic changes. Congestion was the

TABLE II

	ANTEPARTUM						POSTPARTUM					
	PRIMI PARA			MULTI PARA			PRIMI PARA			MULTI PARA		
	BLADDER PER CENT	RT. KIDNEY PER CENT	LT. KIDNEY PER CENT	BLADDER PER CENT	RT. KIDNEY PER CENT	LT. KIDNEY PER CENT	BLADDER PER CENT	RT. KIDNEY PER CENT	LT. KIDNEY PER CENT	BLADDER PER CENT	RT. KIDNEY PER CENT	LT. KIDNEY PER CENT
Albumin	9	0	0	3.86	0	0	0	0	0	0	0	0
Casts	4.5	0	0	0	0	0	0	0	0	0	0	0
Macroscopic pus	40.9	27.3	13.7	26.9	23.11	11.54	40	60	0	60	40	0
Microscopic pus	31.8	22.8	27.3	38.4	34.62	38.40	40	40	60	20	20	60
Staphylococcus	9	4.5	9	7.7	11.54	3.86	0	0	0	0	0	0
organisms	27.3	31.8	18.2	19.2	26.9	15.41	20	40	0	60	40	0
B. coli organisms												
Mixed infection. Staphy-												
lococcus and B. coli												
organisms	13.7	4.5	4.5	7.7	3.86	3.86	40	20	40	20	0	0
No bacteria	45.5	22.8	22.8	65.3	34.62	38.4	0	20	20	20	60	100

first indication of a change from the normal. This was most pronounced in the region of the trigone and internal urethral orifice.

The bladder contour undergoes a certain degree of distortion especially in the region of the trigone. These changes very often made themselves manifest as early as the second month of pregnancy, and as the uterus progressively increased in size, there was an upward displacement of the bladder. This in turn put the trigone on a stretch, and as a result it was lengthened and broadened. The distance between the ureteral orifices gradually became greater, and the inter-ureteric ridge assumed a rope-like appearance as the uterus became larger. Of 58 patients examined 85 per cent were cystoscoped, and in 73 per cent of these, evidence of cystitis was found.

Catheterization of the ureters was attended with a little more difficulty toward the late months of pregnancy. Ureteral obstruction was found in 10 per cent of cases. This condition was found in the right, left or bilateral ureter in the ratio of four, two and one respectively. Ureteritis was of rather infrequent occurrence; it was found only in the right ureter and in the percentage of 3.86.

Our investigations showed a predominance of right kidney infection in excess of left in the ratio of 3 to 1. Fifteen per cent of cases showed evidence of bilateral pyelitis.

Pyclograms were made on 40 per cent of our patients. These were practically all bilateral. A pyeloscopy examination was made in each case, on a specially constructed roentgenoscopic table for this purpose, prior to pyclography. We found this method of procedure an invaluable aid in visualizing through the fluoroscope the position of the ureteral catheters. In the past year at the Woman's Hospital we have never made a pyclogram without first visualizing the ureteral catheters and studying the motor function of the renal pelvis. For this we employed sodium iodide 30 per cent, just enough of the solution being injected to give a clear outline of the calices and pelvis. This usually took from one-half to 3 c.c. The great advantage of this procedure was that both kidney pelves could be examined simultaneously with impunity. As there was no overdistention of the kidney pelvis, the patients experienced very little if any discomfort.

The table employed for this work has a grooved holder on the under side of the fluoroscopic screen, into which can be placed a cassette so that films may be made with the fluoroscopic tube at any stage of the examination. In this way a rapid succession of pictures can be taken of the kidney pelvis at varying degrees of filling as well as emptying of the iodide solution. When the peristaltic activity of the pelvis and ureter had been sufficiently examined, the catheters were withdrawn under direct vision into the lower extremity of the ureters, injecting simultaneously with sodium iodide, a 14 x 17 cm. film being made with the patient prone. The table was then tilted vertically by an

electric motor, and a 14 × 17 cm. film of the entire injected urinary tract in the erect posture was taken anterior posteriorly, whereas the smaller films are taken posterior anteriorly and without a Bucky diaphragm. The catheters were then removed, and the patient was again studied fluoroscopically in regard to peristaltic activity, and emptying time of the kidney pelvis. Renal ptosis or rotation could be readily demonstrated. The amount of excursion the kidneys went through, with each respiration could be very clearly illustrated. This procedure was repeated at various angles by tilting the table back and forth, from the horizontal to the vertical plane. When the examination was completed besides having a bilateral pyeloureterogram in 2 postures for a permanent record, we had a mental picture of what

TABLE III

		ANTEPARTUM		POSTPARTUM	
		PRIMIPARA PER CENT	MULTIPARA PER CENT	PRIMIPARA PER CENT	MULTIPARA PER CENT
Cystoscopies		68.1	80.36	100	100
Cystitis		40.9	53.61	100	100
Ureteritis	Right	3.86	0	0	0
	Left	0	0	0	0
	Bilateral	0	0	0	0
Pyelitis	Right	18.2	19.2	20	40
	Left	0	7.7	0	0
	Bilateral	9	19.2	40	20
Ureteral obstruction	Right	9	11.54	40	0
	Left	4.5	3.86	20	0
	Bilateral	0	3.86	0	0
Pyelograms	Right	4.5	0	0	0
	Left	0	0	0	0
	Bilateral	13.7	19.2	40	80
Hydronephrosis	Right	13.7	11.54	0	20
	Left	4.5	3.86	20	20
	Bilateral	4.5	0	0	20
Ptosis	Right	0	3.86	0	20
	Left	0	0	0	0
	Bilateral	0	3.86	0	0

took place in the kidney pelvis and ureter during the injection of the iodide solution. Referring back to our notes taken of our fluoroscopic study, together with the reading of the pyeloureterogram films, we were able to arrive at a more accurate and complete diagnosis of the case.

In our series of cases, we found hydronephrosis and hydroureter to occur in the right kidney, in excess over the left, at the rate of 3 to 1. There were as many bilateral cases of this lesion as there were left-sided involvements. We also found that hydronephrosis existed in about the same proportion in multipara as primipara. The predominance of right-sided hpdronephrosis can be explained on the same basis as right ureteral obstruction. In regard to renal ptosis, we found this condition present on the right side, and bilateral in the

same proportion, namely, 3.86 per cent. Table III illustrates the percentage of occurrence of all the above-mentioned renal pathology in both primipara and multipara.

The question of treatment of these cases naturally had to be considered from various angles. After a complete urinary history was taken, a careful and thorough physical examination was made by one of us (Dr. Langlois); any patient found showing evidence pointing toward foci of infection in other parts of the body, was referred to other departments for treatment of the foci, and so far as possible, these were removed before active treatment of the urinary tract infection was begun. We feel that considerable comfort has been given these patients by the institution of early appropriate treatment. Those that had cystitis only, received daily bladder instillations of 1 to 3 per cent protargol until the infection and symptoms disappeared. Cases presenting symptoms of ureteral obstruction and pyelitis responded well to weekly or ten-day intervals of ureteral dilations, followed by pelvic lavage of 1 or 2 per cent silver nitrate, collenc or mercurochrome 2 to 5 per cent. The interval between pelvic lavages was gradually extended, as the urine showed signs of improvement. Besides the above local measures, these patients were instructed to take sodium bicarbonate, in teaspoonful doses, three times daily after meals. . The alkali was alternated at two-week intervals with sodium acid phosphates and hexamethylamine in 10 grain doses, the former to be taken one half hour before meals, the latter one half hour after meals, three times daily, during the entire period of urinary tract infection.

We believe that many of our patients suffering from renal ptosis derived considerable relief from the wearing of abdominal supports. At first these patients were sent to surgical appliance firms to be fitted. This proved very unsatisfactory. In the past year, we have procured abdominal supports suitable for the correction of this condition, and have personally fitted these patients with an appropriate support for each individual case. The results from this procedure have been more than gratifying to both the patient and the physician. In order to insure ourselves of results, plain x-ray pictures were taken with the patient wearing the abdominal support, and one with the belt removed. These plates revealed a marked improvement of the situation. The patients wearing a support were instructed to put it on while in the recumbent position before rising from bed, and to wear it constantly. Of course, a certain number of patients, especially those with very low-lying pelvic kidneys were not benefited permanently by this appliance. Their symptoms, however, were ameliorated to the extent that we were able to carry them through their confinement without too much discomfort, until such time that a nephropexy could be performed.

Sufficient time has not yet elapsed for us to have observed many cases through and after delivery, since this investigation was commenced. However, those patients we did follow through showed that the length of time taken to clear up the urinary tract infection varied with the location and extent of the infection; also the month of its occurrence during the pregnancy. Those infections beginning in the second to the sixth month antepartum could be quite well controlled before the time of delivery, and as a result the patient's confinement was devoid of any urinary tract complication, and with the re-establishing of treatment after delivery, the infection usually disappeared at the third or fourth month postpartum. Infections beginning after the sixth month antepartum did not clear up until the fifth or sixth month postpartum. These patients very often had a stormy delivery with frequent exacerbations of acute pyelitis during the puerperium.

SUMMARY AND CONCLUSIONS

1. A study and analysis of 58 cases of urinary tract infections during or after pregnancy is here presented.

2. Infection, ureteral obstruction, hydronephrosis, and hydroureter of the right kidney occurred in excess of the left in the ratio of 3 to 1.

3. The organism causing the infection in the great majority of cases was *B. coli*; the predisposing factors were poor renal drainage combined with intestinal stasis.

4. The onset of urinary symptoms usually took place during the fourth month of pregnancy.

5. Certain physiologic variations in the mucosa and contour of the bladder began as early as the second month of gestation, and persisted until after delivery.

6. Pyeloscopy proved to be an extremely important adjunct to pyelography.

7. The necessity of making an early diagnosis of the urinary tract infection proved to be of paramount importance.

8. A careful search for and the eradication of all foci of infection, including constipation, proved most essential before success in treatment could be accomplished.

9. Our success in the treatment of these patients has been in direct proportion to the early institution of appropriate measures of treatment.

10. Patients with renal ptosis were greatly benefited by the wearing of properly fitted abdominal supports.

11. The importance of urinary tract infections as a complication of pregnancy has not been sufficiently emphasized in the past.

STUDIES ON AVERTIN

BY H. J. STANDER, M.D., BALTIMORE, MD.

(From the Department of Obstetrics of the Johns Hopkins Hospital and University)

FOUR years ago I¹ reported certain chemical and pathologic studies on the inhalation anesthetics, chloroform, ether, nitrous oxide and ethylene, as well as on the commonly employed hypnotics and sodium amytal. In 1927, Eichholtz² demonstrated the anesthetic properties of a new drug, tribromomethyl alcohol, known commercially as avertin, and first prepared by Willstätter and Duisberg³ in 1923. During the past three years, this anesthetic has been widely used, especially in Germany, and several clinical and experimental studies concerning it have appeared. We became interested in the new drug as a means of inducing anesthesia in patients in whom inhalation anesthesia was contraindicated, and have studied it in a manner similar to that employed in our investigations on the other anesthetic agents referred to.

METHODS

All determinations on dogs were made after eighteen hours of starvation, and initial blood specimens were obtained in the morning before the administration of the anesthetic. Only dogs that had not been subjected to previous experimental work, and that were evidently healthy, were used. The blood constituents determined were the nonprotein nitrogen, uric acid, urea nitrogen, chlorides, sugar, CO₂ combining power, acetone bodies, and lactic acid. Sodium oxalate was used as an anticoagulant, and a Folin-Wu filtrate was made within half an hour after the blood was taken. Nonprotein nitrogen and uric acid were determined by the methods of Folin, the urea nitrogen by the van Slyke-Cullen modification of the Marshall method, sugar by Benedict's procedure, chlorides by Whitehorn's method, CO₂ combining power according to the technic of van Slyke, and the acetone bodies by Bokelmann's modification of the Engfeldt method.

The specimens of human blood were similarly analyzed, except that creatinine was determined in addition, by the method of Folin and Wu. All values are expressed in mg. per 100 c.c. of blood, except the CO₂ combining power, which is written in volumes per cent. In our experiments on dogs, as well as in our operative procedures on women, avertin fluid, a solution in amylene hydrate, was used.

All the dogs were sacrificed after the experiment in order to study the tissues microscopically. Tissues were immediately placed in 10 per cent formalin and put through the usual histologic procedures. Dr. Williams kindly corroborated my interpretations of the histologic sections.

RESULTS

From Table I it will be seen that the first dog received small amounts of avertin, and surgical anesthesia did not follow until the dosage had been increased to 500 mg. per kilogram of body weight. During a period of four days, we had an opportunity to study the

TABLE I. BLOOD CHEMICAL CHANGES IN DOGS UNDER AVERTIN ANESTHESIA

DOG NO.	DATE	TIME OF VENEPUNCTURE	AVERTIN ADMINISTERED PER KG.	ANESTHESIA PRODUCED	N.P.N.	UREA NITROGEN	URIC ACID	CHLORIDES	SUGAR	CO ₂	LACTIC ACID
1	2/27/30	11:00 A.M.	Before avertin administration	-----	38	14	0.5	460	78	41	
			120 mg. avertin at 11:29 A.M.	No real anesthesia							
	2/28/30	2:05 P.M.	150 mg. avertin at 11:50 A.M.	No real anesthesia	33			493	100	47	
	3/ 1/30		300 mg. avertin at 10:40 A.M.	No real anesthesia							
2	3/ 3/30	10:00 A.M.			37	14	0.6	508	80	51	
		1:30 P.M.	500 mg. avertin at 10:50 A.M.	Deep anesthesia	38	14	0.8	508	133	47	
	10/ 6/30	11:30 A.M.	Before avertin administration	-----	30	12	0.5	447	95	52	26
		12:15 P.M.	750 mg. avertin at 11:57 A.M.	Deep anesthesia at 12:01 P.M.	31	19	0.6	442	143	51	32
3	10/ 7/30	12:30 P.M.	Before avertin administration	-----	34	18	0.5	459	91	60	33
		12:53 P.M.	500 mg. avertin at 12:42 P.M.	Deep anesthesia at 12:50 P.M.	33	18	0.6	465	100	56	29
	10/ 8/30	11:30 A.M.		Came out of anesthesia at 2:30 P.M. 10/7/30	30	17	0.6	478	95	52	27
Averages for normal dogs before avertin administration											
Averages for dogs under deep avertin anesthesia											
					34	15	0.5	455	88	51	29
					34	14	0.7	471	125	51	30

TABLE II. BLOOD CHEMICAL CHANGES IN WOMEN UNDER AVERTIN ANESTHESIA

CASE NO.	DATE	TIME	ANESTHESIA	N.P.N.	UREA NITROGEN	URIC ACID	CHLO-RIDES	SUGAR	CO ₂	LACTIC ACID	CREAT- ININE
1	9/20/30	10:00 A.M.	Before anesthesia	31.9	19.9	3.6	423	100	45.3	39.7	
		11:50 A.M.	Deep anesthesia	36.5	18.2	3.4	436	94	51.3	21.1	
2	9/30/30	1:10 P.M.	Before anesthesia	46.0	22.7	4.8	469	73	45.7	26.0	
		1:35 P.M.	Deep anesthesia	46.0	18.5	4.7	456	83	45.7	24.7	
3	10/ 3/30	10:10 A.M.	Before anesthesia	38.5	22.7	3.8	466	79	53.2	18.5	1.4
		10:45 A.M.	Deep anesthesia	37.5	20.2	3.6	430	95	53.7	18.5	1.5
4	10/29/30	10:05 A.M.	Before anesthesia	37.5	14.1	2.3	462	74	59.8		
		10:45 A.M.	Deep anesthesia	37.8	14.2	2.3	462	88	58.9		
		2:00 P.M.	Coming out of anesthesia	34.5	14.2	2.4	452	152	51.3		
5	5/ 5/30	10:15 A.M.	Before anesthesia	24.8		1.9	488	86	43.8	21.7	1.1
		10:40 A.M.	Deep anesthesia	25.0		1.8	477	88	37.2	22.0	1.1
		3:45 P.M.	Coming out of anesthesia	22.8		2.6	482	101	43.8	34.5	1.2
			Before anesthesia	35.7	14.8	3.3	462	82	49.6	26.5	1.2
Averages			Deep anesthesia	36.5	17.8	3.2	452	89	49.4	21.6	1.3

blood chemistry of this animal under increasing doses of avertin. It will be noted that the nonprotein nitrogen, urea nitrogen, uric acid, and CO_2 combining power of the blood remained practically stationary throughout the entire period, and that the only changes observed were an increase in sugar from about 100 to about 130 mg. per 100 c.c. of blood, and a slight increase in blood chlorides. From a study of the other dogs whose protocols are reported in Table I, we note that the only change in the blood constituents during deep avertin anesthesia consisted in a slight increase in the blood sugar.

In Table II are reported the findings in five patients who were subjected to avertin anesthesia. All of these women were operated on for some gynecologic indication, and in none was there any reason to suspect kidney or liver disease. In other words, they were all fairly healthy individuals, with some minor abnormality of the generative tract, such as a cystic ovary, an old complete tear, a retrodisplacement of the uterus, and were selected for study because of the nonmedical nature of the condition needing operative intervention.

The values in this table are in full agreement with those in Table I, and show that the various blood constituents were unaffected by the avertin anesthesia, except that the blood sugar showed a slight rise in four out of the five patients. The CO_2 combining power remained practically stationary, and there is no accumulation of lactic acid in the blood stream. It should be noted that the first two specimens of blood, taken "before anesthesia" and in "deep anesthesia" respectively, as noted in the table, were obtained before any ether was administered to the patient. The third blood specimen, however, labelled "coming out of anesthesia," was obtained after the administration of from one-half ounce to three ounces of ether during the operation, and this perhaps explains the relatively high blood sugar and lactic acid, and the lowered CO_2 combining power found in that group.

Histologic study of the liver and kidney tissues of the Dogs 1, 2 and 3, revealed no abnormal changes. Dogs 4 and 5 showed slight central fatty degeneration of the liver, but to no greater extent than is often noted in the livers of normal dogs. In other words, we observed no evidence of liver necrosis as a result of avertin anesthesia, when administered to dogs in the doses indicated in Table I.

DISCUSSION

Bruger, Bourne and Dreyer⁴ tested the effect of avertin on liver function by means of the bromsulphthalein procedure of Rosenthal and White, and found that the drug had very little effect on hepatic function, comparing favorably in this respect with amytal and ether. Our histologic findings are in agreement with their results. However, in view of the manner in which avertin is detoxicated in the liver⁵ it

does not seem advisable to use it in such conditions as eclampsia, in which liver injury is an outstanding factor.

Bruger, Bourne and Dreyer report no significant change in the CO_2 combining power of the blood in dogs under the influence of avertin, a finding which accords with our results. As stated above, our figures following the administration of avertin reveal no marked change in any of the blood constituents studied, except a very slight rise in blood sugar. The absence of a decrease in blood alkali reserve, and of an accumulation of lactic acid, as well as the presence of such a slight hyperglycemia, would indicate that the average dose of avertin (about 100 mg. per kilogram of body weight in the human) administered rectally, produces very slight, if any, acidosis; and in this respect avertin does not resemble the inhalation anesthetics, chloroform, ether and nitrous oxide, but rather the barbituric acid derivative, amytal.

It appears that in surgical anesthesia produced by avertin, anoxemia does not play an important rôle, as for example, in nitrous oxide anesthesia. It is possible, however, that it may have some effect on carbohydrate metabolism, similar to that reported with amytal by Hines, Boyd and Leese.⁶

During the past year I have used avertin as a basal anesthetic, together with small amounts of ether, in various gynecologic operations and have had no untoward results. I have also used it with satisfactory results in cases of cardiac disease where it was necessary to end pregnancy by means of abdominal hysterectomy, as well as in two conservative cesarean sections. I have, however, had no experience with it in the conduct of normal labor or in the treatment of patients suffering from eclampsia.

CONCLUSIONS

1. In women the administration of tribromomethyl alcohol (avertin) in a dosage amounting to 100 mg. of the drug per kilogram of body weight, produces no change in the nonprotein nitrogen, urea nitrogen, uric acid, lactic acid, creatinine, chlorides, and CO_2 combining power of the blood, and only a very slight increase in blood sugar.

2. Anoxemia seems to play no appreciable rôle in the anesthesia produced by avertin.

3. Similarly, anesthesia in dogs, induced by 500 mg. of avertin per kilogram of body weight produces no appreciable change in the blood chemistry, as well as no signs of necrosis in the liver or kidneys.

4. No untoward results or symptoms have been experienced following the use of avertin as a basal anesthetic in a limited number of gynecologic operations which I have performed.

5. I have, furthermore, used this anesthetic in cardiac disease necessitating operative interruption of pregnancy with good effect.

6. Avertin anesthesia seems especially indicated in patients in whom general inhalation anesthesia is contraindicated, and who present no evidence of disturbed hepatic or renal function.

7. An important precaution in its administration is that the avertin solution be not heated above 40° C., as the drug is unstable at higher temperatures. A further precaution is that the patient be carefully watched during the early postoperative period, in order to prevent swallowing of the tongue.

8. I have had no experience with the use of avertin in the treatment of eclampsia, but on theoretical grounds, I am of the opinion that before we advocate its use in this respect it may be advisable to study the effect of the drug on animals with damaged liver and decreased hepatic function.

9. Avertin appears to be a safe basal anesthetic, when administered in amounts not exceeding 100 mg. per kilo of body weight, in patients with adequate renal and hepatic function.

REFERENCES

- (1) *Stander, H. J.*: AM. J. OBST. & GYNEC. 12: 633, 1926. (2) *Eichholtz, F.*: Deutsche. med. Wchnsehr. 53: 710, 1927. (3) *Willstätter, R., and Duisberg, W.*: Ber. d. deutsch. chem. Gesellsch. 54: 2283, 1923. (4) *Bruger, M., Bourne, W., and Dreyer, N. B.*: Am. J. Surg. 9: 84, 1930. (5) *Endoh, C.*: Biochem. Ztschr. 152: 276, 1924. (6) *Hines, H. M., Boyd, J. D., and Leese, C. E.*: Am. J. Physiol. 76: 293, 1926.

Crousse: Posterior Vaginal Hernia and Its Treatment. Bruxelles med. 10: 904, 1930.

Though vaginal hernia is a comparatively rare condition the surgeon should be able to recognize and treat it appropriately. Etiologically it is practically always an acquired condition, pregnancy, ascites, and abdominal tumors being contributing factors. Anatomically it consists of a descent of the peritoneum of Douglas' pouch into the perineal body. Within this sac may be found fluid or intestinal coils. The hernia may occur below the vaginal mucosa and protrude into the vagina. Again the sac may find its way between the muscles and the rectal wall and appear as a bulging mass within the rectum. Finally it may separate the perineal muscles and appear under the skin of the perineal body.

Symptomatically one finds tumor formation presenting the various manifestations of hernia elsewhere, that is, transmission of impulse, increased size on straining, and reducibility. There may or may not be an associated rectocele.

Treatment consists in reduction of the hernial contents, isolation, closure, and fixation of the sac with excision of the redundant peritoneum, and closure of the weakened area by uniting the uterosacral ligaments, the serosa of the rectum and the posterior surface of the uterus. The support of the perineal floor is then restored as in any plastic perineal operation.

THEO. W. ADAMS.

PERNOCTON AS AN ANALGESIC IN OBSTETRICS AND GYNECOLOGY*

BY RADFORD BROWN, M.D., HOWARD MOLOY, M.D., AND MARIAN LAIRD, M.D., NEW YORK, N. Y.

(From the Department of Obstetrics and Gynecology, Columbia University, Sloane Hospital for Women)

THIS paper is a report on the results of the use of Pernocton at Sloane Hospital. It was used in 133 obstetric cases as an analgesic, and in 20 gynecologic cases as an adjuvant anesthetic.

Pernocton is a 10 per cent aqueous solution of the sodium salt of the secondary butyl- β -bromallyl barbituric acid. In the body it is transformed first into acetonyl barbituric acid, and then into other substances which are inert and practically nontoxic. They have been given to animals but did not produce a hypnotic effect. It has not been possible to trace pernocton in the urine, but only these transformation products in a quantity which corresponds to about one-fifth the amount of pernocton administered.

There has been developed in Germany an extensive literature on the subject of pernocton, but we have been unable to find reports of any work being done in this country.

Bumm of Berlin originally investigated this drug in 1926 and 1927. He concluded after his experiments with Somnifen that it produced undue excitation, that the postoperative sleep of twelve to twenty-four hours was too prolonged, and that there was definite evidence of renal damage in three cases. He felt that pernocton did not possess these disadvantages. Dogs were used as the subjects of his animal experiments. The minimum lethal dose was ten times the minimum effective dose, leaving rather a generous margin of safety. In lethal doses death was caused by paralysis of the respiratory center. Clinically he believed the intravenous route to be the method of choice. His average dose was 0.7 to 0.8 mg. per kg. of body weight (corresponding to 4 to 6 c.c. of the 10 per cent solution), supplemented with ether. This was preceded by morphine and atropine. Respirations were quiet and of the same depth and rate. Blood pressure dropped from five to ten points, the pulse was not affected. The patients were sleepy for twenty-four hours and one-third of them showed postoperative restlessness. There was no nausea or vomiting. Urinalysis revealed no evidence of renal or hepatic damage. Bumm concluded that pernocton possessed distinct advantages over other drugs thus far developed for the production of anesthesia in surgery.

In a subsequent article reported on 80 additional surgical cases, he confirmed his original findings.

Goldschmidt reported favorable results on the use of pernocton in 52 labor cases. He used 1 c.c. per 12.5 kg. of body weight; the smallest effective dose being 3.5 c.c., and the largest being 7 c.c. There was complete amnesia in 62 per cent, and pain

*Presented before the New York Academy of Medicine, Section of Obstetrics and Gynecology, December 23, 1930.

was less in 66 per cent. A repeated dose was given to 20 per cent. He stated that suggestion is important and quite essential. His patients were unconscious for thirty minutes or more, after which they would answer questions which they did not remember later. Occasionally the pains would be lessened for twenty to thirty minutes. When there was too great a diminution of contractions pituitrin was given. The average blood loss was 330 c.c. Most of the patients awakened after the end of the third stage. Less ether was used for repair work. He reported two infant deaths, one of which was in a premature and the other a forceps delivery. Autopsy reports were not given.

Goetz gave his conclusions after using pernocton in 50 obstetric cases with both spontaneous and operative deliveries, including one cesarean section. His dosage was 1 c.c. per 10 kg. of body weight. He emphasized the importance of slow injection to prevent excitation. The patients had a complete amnesia but were restless on awakening. The drug was given to primiparas at full dilatation and to multiparas shortly before that stage. No effect was noted on the infants and there were no maternal deaths.

Hole used the drug in 120 cases, also employing the intravenous route. He gave it when strong contractions, lasting at least twenty seconds, were coming at twenty minute intervals. Dosage varied from 4.4 c.c. to 7.5 c.c., depending upon the patient's weight. Repeated doses from 1 to 2 c.c., up to two doses, were given. One hundred and eight had an ideal amnesia, but 25 were more or less excited. Pituitrin was used to stimulate contractions in fifteen cases.

Wolfgang Schmidt confirmed the results of Goldschmidt, Hole and Goetz in 100 obstetric cases. Twenty-six per cent of his cases showed varying degrees of restlessness, several having urinary and fecal incontinence.

Braun was quite enthusiastic about its use in both surgery and obstetrics. In minor gynecologic operations he found no additional anesthetic necessary.

Alke has used pernocton for two and a half years in over 1200 surgical cases. His series included both adults and children and even nursing infants. At first he used the usual dose, 1 c.c. per 12.5 kg. of body weight, preceded by morphine and atropine, but subsequently used smaller doses, 1 to 3 c.c., merely as an adjuvant to ether, and the preliminary medication was omitted. He claimed that the amount of ether was reduced by 50 to 90 per cent. Suggestion was largely employed and the excitement stage with ether was eliminated. There was no postoperative restlessness. Pernocton was not used in shock or in patients with low blood pressure. No undesirable effects were noted from its use. In children relatively larger doses were employed, usually 1 c.c. per kg. of body weight.

Hartung agreed with Alke that pernocton was best used as an adjuvant to ether, and that it should not be given in large doses to produce anesthesia alone. He also stressed the importance of suggestion. He warned against morphine and pernocton together because of the danger of respiratory paralysis. One death in his series of 52 cases was reviewed and the fatality was laid to this cause, although there was no autopsy. This patient had $\frac{1}{4}$ gr. of morphine and 5 c.c. of pernocton. A combined operation on the kidney and hip joint was performed. Shortly following the operative procedure the respirations became slower and more shallow and then ceased. They were revived with respiratory stimulants and were of the Cheyne-Stokes type. After a short time the patient died. Hartung concluded that pernocton was a valuable refinement in anesthesia but that it should be used in medium doses, 4 to 6 c.c., and in conjunction with ether or nitrous oxide.

Pernocton is marketed in a 10 per cent solution in 2.2 c.c. ampules. This is suitable for either intravenous or intramuscular injection. In our cases the intravenous method was used exclusively.

No attempt was made to accurately regulate the dosage according to body weight. In the obstetric group women of average weight and stature received 4.4 c.c. as the usual initial dose; and this varied according as she were either over or under average. The minimum dose was 2.2 c.c. and the maximum 6.6 c.c. When repeated, 2.2 c.c. was the usual amount; but 4.4 c.c. was given on several occasions.

OBSTETRIC GROUP

Labor was well established with strong uterine contractions, at three to five minute intervals, before injection was given.

One hundred patients were in the first stage of labor, 47 early (with the cervix three fingers' dilated or less), and 56 late (with the cervix from three fingers' to almost complete dilatation). Thirty-three were in the second stage, 23 early (with full dilatation), and 10 late (with the caput on the pelvic floor). The injection was given between pains, and never faster than 1 c.c. per minute. The importance of slow administration should be emphasized, for when the drug is given rapidly there is apt to be a sudden drop in blood pressure and marked excitation.

Effect on the Mother.—We found that the patients usually passed into what seemed to be a deep sleep before the injection was completed. There was occasional moaning during contractions, but in the intervals there was a return to complete unconsciousness. This state lasted from thirty minutes to four or five hours. When the analgesic effect of the pernocton began to wear off, the patients would sometimes cry out during a pain, but did not remember it later. Respirations were occasionally slowed, but only slightly, and then tended to be deeper. Pulse and blood pressure records showed only the normal variations for labor. The greatest drop recorded in blood pressure was twenty points. Uterine contractions were occasionally diminished; in three cases the pains ceased for twenty to thirty minutes, but then returned, gradually attaining their former intensity. However, in the majority of cases the contractions were either unaffected or definitely increased as to frequency and duration. This was particularly noted in a number of cases when pernocton was given early in the second stage and delivery followed almost precipitously.

The only undesirable effect noted was restlessness. Six women showed marked motor excitability, continually rolling and tossing about in bed and crying out with pains. Three of these patients became sufficiently unmanageable to need restraint. Where this was encountered it was observed that the patients were Latins of a volatile temperament, often unsuited to the protracted nervous and physical strain of labor. Eighteen women were moderately restless but required no restraint. These patients had varying periods of amnesia, and when later asked their opinion of pernocton, said it had given them relief.

The results in 46 cases were recorded as very favorable. In this group the patients were apparently entirely relieved of pain after injection and had complete amnesia for the events of labor and delivery. In 72 cases the effect was moderately favorable. Here the patients experienced some pain when the effects of the pernocton wore off before delivery, and they had a partial amnesia. In three cases there was no relief. Their pain was not relieved nor was there any clouding of consciousness. Possibly the uncooperative attitude of the patients was partly responsible for their lack of relief.

After the initial injection 6 patients delivered in thirty minutes or less, 18 in thirty minutes to one hour, 35 in one to two hours, 25 in two to three hours, and 36 in over three hours. The average duration of labor was eighteen hours.

There was spontaneous delivery in 90 cases, low forceps in 25, midforceps in 2, and breech extraction in 3. This corresponds favorably with the usual figures.

There was one neonatal death following breech delivery; an autopsy revealed a broken neck. There were 32 episiotomies. The majority of cases required supplementary anesthesia, either nitrous oxide or ether, during the actual delivery.

In this series there were 120 primiparas and 13 multiparas. Ninety-six were typed as having a normal pelvis, 8 funnel, 7 flat, 7 generally contracted, and 2 male.

Maternal Mortality.—There was one maternal death. Mrs. K. K., Japanese, aged twenty-one, primipara, entered the hospital at 9:00 A.M. December 2, 1930, in labor, pains having begun at 7:00 A.M. Her pregnancy was uneventful and physical examination negative. Laboratory findings were normal. Her temperature on admission was normal. Labor progressed satisfactorily and at 2:25 P.M., after she began to complain of her pains, she was given pernocton. After about 2 c.c. had been injected she became extremely restless, jerking her arm so that the needle became dislodged from the vein. At 2:50 P.M. she was given an additional 2.2 c.c. Following this she slept quietly between pains for about thirty minutes, after which she again became restless. The caput was on the pelvic floor and as there appeared to be no advance it was decided to take the patient to the delivery room. She was there given an ether anesthetic, which was taken badly, and episiotomy and low forceps delivery were performed at 4:10 P.M. The baby was in good condition. There was no unusual blood loss, but during and following delivery her pulse varied between 120 and 130. She coughed up considerable mucus. Consciousness was regained shortly after delivery. At 5:30 P.M. her condition was noted as fair, the pulse remaining elevated and the cough persisting. At 6:00 P.M. there was marked restlessness, the cough was more severe and blood tinged sputum was being raised with difficulty. At 7:00 P.M. there was dyspnea and cyanosis and her condition was distinctly worse. One-fourth gr. of morphine and 1/150 gr. of atropine were given. Her breathing became still more difficult and 10 gr. of caffeine-sodium-benzoate was given subcutaneously. There was at this time profuse bloody sputum. A nasal catheter was inserted and oxygen and carbon dioxide were administered without improvement. Respirations ceased at 7:30 P.M., three hours and twenty minutes after delivery. Artificial respiration was resorted to for fifteen minutes without avail.

The cause of death was thought to have been a pulmonary embolus, but autopsy, limited to the chest and abdomen, failed to reveal such a finding. There was however an early bronchopneumonia. Large groups of alveoli were hemorrhagic and contained many polymorphonuclear leucocytes. There was no infiltration of the alveolar septa. This pneumonia was not deemed sufficiently advanced to have caused her death. But on the other hand, in view of the patient's course, we did not feel that pernocton either was the direct cause of death, but was probably contributory.

Effect on the Baby.—Ten babies were noted as slow in breathing. They all responded to the usual methods of stimulation, only one requiring tubbing. Their subsequent course was normal.

GYNECOLOGIC GROUP

Pernocton was employed either as an adjuvant to nitrous oxide or alone in 20 operations.

There were included 4 hysterectomies, 2 abdominal hysterotomies with sterilization, 6 vaginal plastic repairs, and 8 curettages, 4 of which were followed by insertion of radium. The average dose was 6 c.c., the largest being 8 c.c. and the smallest 5 c.c. As in the obstetric cases, the dose was governed roughly by body weight. One patient received an additional injection of 1 c.c. Sixteen were given preliminary medication consisting of $\frac{1}{6}$ gr. of morphine and $\frac{1}{200}$ gr. of scopolamine.

One patient was definitely excited by the morphine and was later found to have an idiosyncrasy for it. Nitrous oxide was necessary in 10 cases to supplement the effect of pernocton.

All the patients were unconscious before the completion of the injection, usually by the time 4 c.c. had been given. Involuntary movements of the hands and feet and turning of the head from side to side were observations made in 8 cases. All of these were eventually given nitrous oxide. Immediately following the injection in two, there was hiccough lasting for two or three minutes. Fibrillary twitching of small muscle groups was noted in several patients. The others remained in what appeared to be a natural sleep and were well relaxed until varying periods after operation. There was no depression of the respiratory rate below the normal even in cases where pernocton had been preceded by morphine. In several cases, however, the rate was elevated due to nervousness on arriving in the anesthesia room, but after the injection promptly returned to normal. The breathing was regular and deep. No unusual effect was observed on the pulse. There was a fairly consistent drop in the systolic blood pressure, the average being 20 points. The greatest drop was 40 mm. In ten to fifteen minutes there was, however, a gradual rise to approximately the former level. Either before or during the operation 10 patients became restless necessitating the addition of nitrous oxide.

Following operation, consciousness was regained in periods varying from thirty minutes to six hours, with an average of two hours. During this period several patients were restless, frequently turning from side to side and had to be watched carefully to prevent their falling out of bed. They all remarked that the usual fear of the anesthetic was entirely eliminated. Nausea was rare and vomiting was absent. There was a marked decrease in the use of sedative postoperatively for the first twenty-four hours.

Two illustrative cases may be briefly reviewed. One of these was a woman of seventy-four years with menorrhagia and weighing 180 pounds. She had a marked degree of senile dementia, and consented to come to the hospital only after great urging and the promise that there would be no operation. It was evidently impossible to take her to the operating room while she was conscious without resorting to force. This being undesirable it was decided to give her pernocton in the room. She received 6 c.c. intravenously and promptly went off to sleep. The trip to the operating room was uneventful. The operation, a curettage and insertion of radium, was performed without difficulty and she was back in her bed several hours before awakening. She never knew that an operation had been done. Another patient with fibroids and relaxed pelvic floor had a chronic bronchitis and it was desirable to avoid ether. Following an injection of morphine she was given 6 c.c. of pernocton, which produced such an ideal anesthesia that the administration of nitrous oxide, which had been planned, was postponed until it should be necessary. The operation consisted of dilatation and curettage, perineorrhaphy and supra-vaginal hysterectomy. No additional anesthetic was used throughout the entire operation; relaxation being good until the closure when suture of the peritoneum caused slight restlessness. The operation lasted one hour and twenty minutes. Consciousness was regained in seven hours, there was no nausea or vomiting and the only sedative necessary was allonal.

SUMMARY

Gynecologic Cases.—Pernocton was employed in 20 gynecologic cases, in 10 of which it was supplemented by nitrous oxide or oxygen. The operations included 6 laparotomies, 6 vaginal plastic repairs, and 8 curettages. The average dose was 6 c.c., intravenously, preceded by morphine in 16 cases. The immediate effect was unconsciousness but

there was restlessness appearing at varying intervals in 10 cases and when this occurred nitrous oxide inhalations were begun. The usual unpleasant experience of induction by ordinary methods was eliminated. Several patients were moderately restless after returning to their beds. Postoperative nausea was rare and vomiting was absent. There was a marked decrease in the use of sedative for pain after operation.

Obstetric Cases.—Pernocton was used in 133 labor cases. The usual dose was 4.4 c.c.; in a few instances 2.2 c.c. was used; and less frequently 6.6 c.c. was given. A repeat dose was given twelve times.

The first injection was given to 100 patients in the first stage and to 33 in the second.

The effect on the patient was either very favorable or moderately so in 130 cases, there being complete relief of pain for varying periods of time, from thirty minutes to four hours. Amnesia was also a fairly constant effect.

In 3 cases there was no apparent relief.

Twenty-four cases showed varying degrees of restlessness, several requiring restraint.

No untoward effects were noted on the pulse, respiration or blood pressure.

The average duration of labor from the initial injection to delivery was approximately three hours. The average labor was eighteen hours. Delivery was spontaneous in 103; low forceps were used in 25, midforceps in 2, and there were 3 breech extractions.

Ten babies were slow in breathing and required mild stimulation.

There was one maternal death which cannot definitely be ascribed to pernocton, although autopsy failed to reveal the actual cause. One neonatal death occurred following a breech delivery, autopsy revealing a broken neck.

In conclusion it may be said that in our opinion the use of pernocton is a distinct refinement in anesthesia. Oftentimes it may be used as the sole anesthetic agent. When supplemented by an inhalation anesthetic, the amount of that substance needed was markedly reduced.

We believe the use of pernocton in labor is a distinct advance in obstetric analgesia. The relief of pain and the accompanying amnesia are the most notable of the effects. The fact that there is no tendency to prolong labor is important. In this connection it has a distinct advantage over rectal analgesia and morphine. The occasional tendency to produce excitation is apparently the only unhappy finding. There is no tendency for the baby to be dangerously narcotized, and except for the questionable maternal death we believe it to be, in ordinary doses, without danger to the mother.

Note: Since reading this paper slight modifications have been made in the methods employed in the gynecologic cases. Smaller doses are given, the maximum being 5 c.c., and the pernocton is always supplemented by some form of inhalation anesthesia, usually nitrous oxide and oxygen.

REFERENCES

- Alke*: Deutsche med. Wchnschr. 56: 440, 1930. *Braun*: Zentralbl. f. Gynäk. 54: 1648, 1930. *Bumm, L.*: Deutsche Ztschr. f. Chir. 202: 289, 1927; Klin. Wchnschr. 6: 725, 1927. *Goetz*: Zentralbl. f. Gynäk. 53: 874, 1929. *Goldschmidt*: Zentralbl. f. Gynäk. 54: 344, 1930. *Hartung*: Arch. f. Klin. Chir. 153: 664, 1928. *Holz*: Zentralbl. f. Gynäk. 53: 974, 1929. *Schmidt*: Med. Klin. 26: 956, 1930.

THE EFFECT OF ANTERIOR HYPOPHYSEAL IMPLANTS UPON SENILE OVARIES OF MICE*

By JACOB HOFFMAN, M.D., PHILADELPHIA, PA.

(From the Department of Gynecology, Jefferson Medical College)

IN THE last decade many advances have been made in our understanding of the physiology of the sex cycle. Of especial interest are the studies that deal with the hormones of the anterior lobe of the hypophysis and their relationship to the ovary.

The probability of some relation in function between the hypophysis and the ovary has long been evident as a result of clinical observation. Until recently, however, there was very little experimental proof. It is known that tumors of the hypophysis cause abnormal growth and sexual prematurity.

Aschner has shown that regressive changes take place in the genitalia following partial or total extirpation of the hypophyseal gland. The striking clinical picture of dystrophia adiposo-genitalis is also significant in this connection. Erdheim and Stumme have pointed out that during pregnancy the anterior hypophysis hypertrophies and may give the features of the pregnant woman an acromegalous appearance. The occurrence of hypoplasia of the genitalia following roentgen irradiation of the hypophysis in rabbits, a fact established through the efforts of Frankel and Geller, further suggests such a relationship. Ten years ago, Reye and Budde described the clinical picture of hypophyseal cachexia. This malady is characterized by a profound body weakness, loss of the axillary and pubic hair, and cessation of menstruation in young women. It is significant that the administration of anterior hypophyseal extracts remedies the condition while a withdrawal of this therapeutic measure brings about a return of the symptoms.

The beginning of our recent and important advance in the true interpretation of the physiologic action of the anterior hypophyseal hormones is found in the epoch-making work of Evans and Long. Their studies are responsible for the great flood of experimental data dealing with the pituitary gland. Employing extracts obtained from the anterior lobe, they were able, by means of prolonged intraperitoneal injections, to produce giantism in rats. All of the organs in the body were enlarged, with the exception of the uterus. The ovaries in these experimental animals were double the weight of the ovaries in the control animals. A great amount

*Read at a meeting of the Obstetrical Society of Philadelphia, January 9, 1931.

of lutein tissue was found around the ova of the unruptured and atretic follicles. The estrual phases took place at long intervals and sometimes ceased altogether. They concluded from their results that the anterior hypophysis contains, in addition to the growth-producing hormone, a second hormone that induces luteinization of the follicles without preceding ovulation, and retards or even suppresses estrus.

Quite in contrast to these observations were those of Smith and Engle in this country, and Zondek and Aschheim, in Germany. Working independently and almost at the same time, they began to employ gland implants instead of gland extract in injections. Smith and Engle's technic differed somewhat from that of Zondek and Aschheim, but their results were practically the same. Their technic consisted of repeated implants in immature female mice and rats of a weaning

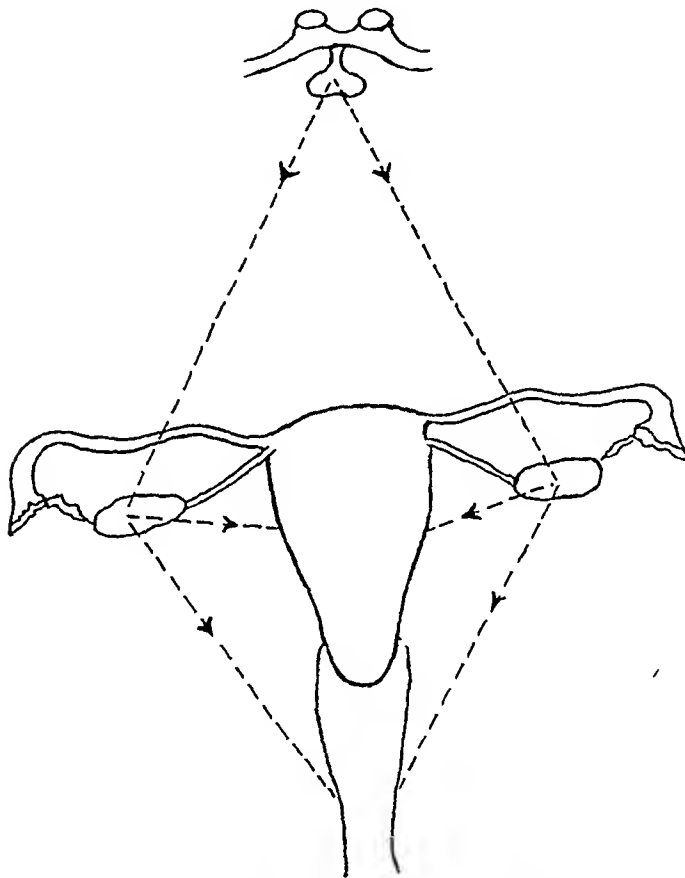


Fig. 1.—Schematic drawing showing the direct effect of the anterior hypophyseal hormone upon the ovary; the mobilized ovarian hormone secondarily affects the uterus and vagina. (After Zondek and Aschheim.)

age, which were employed as test animals. The effect upon the genitalia was marked. The uterus became hyperemic and distended. The ovaries grew distinctly larger and exhibited a number of corpora lutea. Superovulation was the rule in their experiments.

Zondek and Aschheim, on the other hand, used immature female mice weighing 6 to 8 gm. as test animals, on the assumption that weight was a more accurate criterion of immaturity. Their technic differed further in that they used only a single implant. They have repeated their experiments many times and, as a result of their observations, it may be stated that one hundred hours following the implantations of anterior pituitary gland substance there occur definite changes in

the ovaries and the lower genital tract. The ovaries increase in size to a considerable extent and there is a marked hyperemia with hemorrhage into the follicles. Maturation of follicles follows with the subsequent formation of corpora lutea. The uterus becomes distended and the vagina shows the characteristic changes of estrus. These results present an interesting contrast to the retardation of ovulation and the imprisonment of ova, which are consequent to the use of extracts as noted above in the experiments of Evans and Long.

Taken together, the experiments noted clearly demonstrate that the anterior lobe of the hypophysis contains powerful hormones capable of producing general growth or giantism of the organism, maturing infantile ovaries, initiating ovarian function, and bringing the entire follicular apparatus into play, with the resulting production of folliculin, the estrus-inducing hormone. It is important to remember

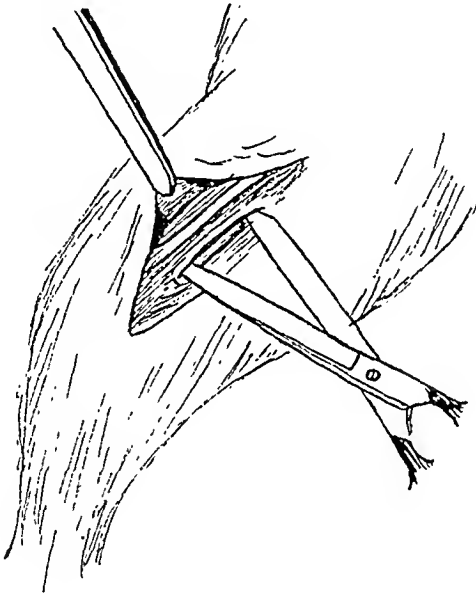


Fig. 2.—Technic of implantation (1). (After Zondek.)

that the hypophyseal hormones act only by way of the ovary and have no direct effect upon the uterus and vagina, as shown by control experiments on castrated animals. The action of the pituitary hormones, of course, leads secondarily, by its stimulation of the ovary, to the production of the so-called female sex hormone in the graafian follicle, the corpus luteum, and the placenta, and these do affect directly the lower genital tract. (See Fig. 1.)

The experiments to which we wish to draw your attention were supplementary to those described of Zondek and Aschheim. As it appears that the anterior hypophysis is the agent responsible for ovarian activity, and that a small implant brings about sexual maturity in infantile mice through activation of the ovaries, it seemed to us that it would be of interest to study the effect of similar implants in old, sexually degenerated nonestrus mice. The problem was to

determine whether senile animals, showing no estrus for a long time, could once again be brought to sexual function. A further problem was to ascertain whether the reestablished ovarian activity could be prolonged over a considerable period of time without the intervention of further stimulation. Finally, it remained to be seen whether ovulation with subsequent gestation could be reestablished in these senile menopausal mice.

The following experiments were carried out in the laboratories of the Charité Frauenklinik, Berlin, under the personal supervision of Professors B. Zondek and S. Aschheim, and later in America. Reference to the results obtained by the author is made by Professors Zondek and Aschheim in a previous communication. We wish to

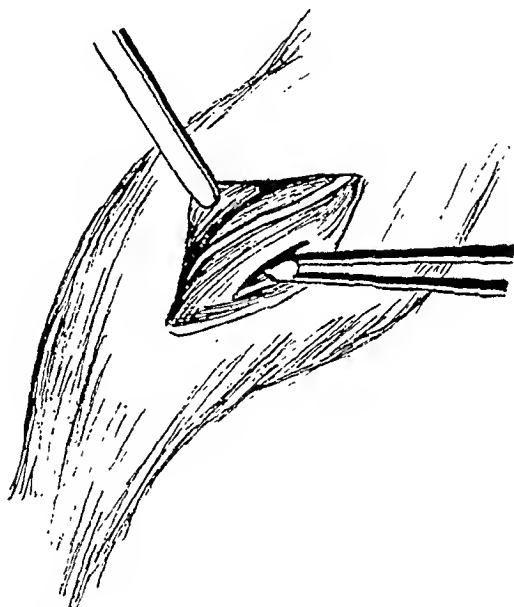


Fig. 3.—Technic of implantation (2). (After Zondek.)

make a preliminary report of the work at this time. It is our intention to confirm these results by further investigation, a complete report of which will be made at a later date.

Senile, nonestrus white mice were used as test animals. These old rodents, although known to be nonestrus for a long time, were nevertheless again closely observed over a period of several months. For this purpose, vaginal smears were employed as an index of the various sexual phases, in accordance with the findings of Allen, Long, Evans and others, who demonstrated the succession of changes in the vaginal lumen of mice and rats during the estrual cycle. The absence of such cyclic phenomena in old mice would therefore indicate the absence of ovarian or estrus-inducing hormone. Vaginal spreads, taken daily throughout this period of observation, failed to disclose a single estrual phase.

To secure the greatest possible accuracy in these experiments, the left ovary of some of the test animals was removed, to be used as a control, for comparison with the remaining stimulated ovary after implantation. The technic was simple and may be described as follows: Under ether anesthesia, a small incision is made over the lower part of the spine, the skin flaps are retracted and the ovary removed through a puncture wound in the muscle and fascia alongside the spine. The ovary, immediately after removal, is placed in Zenker's fluid and prepared for serial section. The incision is closed with linen thread. The entire procedure occupies only a few minutes.

At the same time that the unilateral oophorectomy is performed, each of the test animals receives a single implant of fresh anterior hypophysis of the cow. The implant is made as follows: A small slit is made over the adductor muscles of the upper thigh. The femoral artery is exposed and, with the aid of a fine pair of forceps, a piece of fresh gland, about the size of a pea, is inserted into the muscles lying beneath the artery. Care is taken not to sever the artery, for the success of the implant depends upon a good blood supply. The incision is closed with linen thread. (See Figs. 2 and 3.)

Four days after implantation, all the animals, twenty in the series, were found to be in estrus, as evidenced by the vaginal spreads. It may be assumed from this, that the implant is sufficiently potent to so stimulate the stagnant ovary that it can mobilize the latent, residual, follicular, estrus-inducing hormone and thus reestablish the estrual cycle in nonestrus old mice.

Attention was next directed to the further problem, whether the test animals, thus brought to an estrus phase, would continue to have further successive periods. Vaginal smears disclosed twelve additional cycles, covering a period of two months, without the intervention of further stimulation. The single implant produced not merely a single estrual phase but activated the senile ovary sufficiently to bring about many successive estrual cycles. These results would perhaps warrant the important and striking conclusion that the prolonged effect is not dependent upon the continued integrity and activity of the implant itself; that it is sufficient that the implant is present long enough to stimulate the stagnant ovary and initiate ovarian activity. This, once started, seems to continue by its own momentum, notwithstanding regression of the implant itself thereafter. We may be justified, therefore, in regarding the implant not merely as a substitutive therapy, but rather as an activator like the crank of a gasoline motor. It sets other forces in motion, and, once these latent forces are awakened, it ceases to be essential. We hope in our future experiments to more conclusively demonstrate this point.

A brief résumé of the history of Test Mouse No. 021 will illustrate the situation. This mouse was observed by means of daily vaginal smears from January 15 to

March 18 and no estrual periods were noticed. On March 18, a unilateral oophorectomy was performed and, at the same time, an implant was inserted in the adductors of the thigh. Three days later, on March 21, estrus was observed for the first time. Without the aid of further stimulation of any kind, estrus was again observed on the following dates: April 4, 10, 15, 22, 26, 30, May 5, 10, 15, 20, and 22. It is to be noted that the intervals, which range from two to seven days, making an average of not quite five days, compare favorably with the four-day periods characteristic of normal, young, mature mice. On June 5, while it was in a state of estrus, the mouse was killed. Autopsy revealed the remaining ovary to be markedly enlarged and highly hyperemic. The ovary was about ten times the size of the control and its surface presented a few hemorrhagic spots. The ovary was removed and serial sections made for comparison with the control.

There still remained the question whether, by means of the implant, ovulation might once again be induced, with subsequent gestation. The answer is found in the proctol of Test Mouse No. 0029.

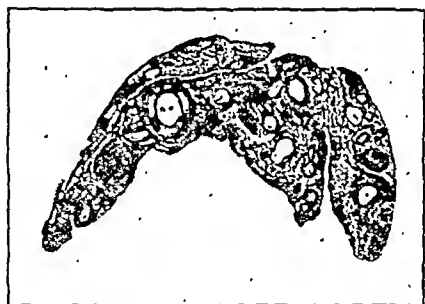


Fig. 4.

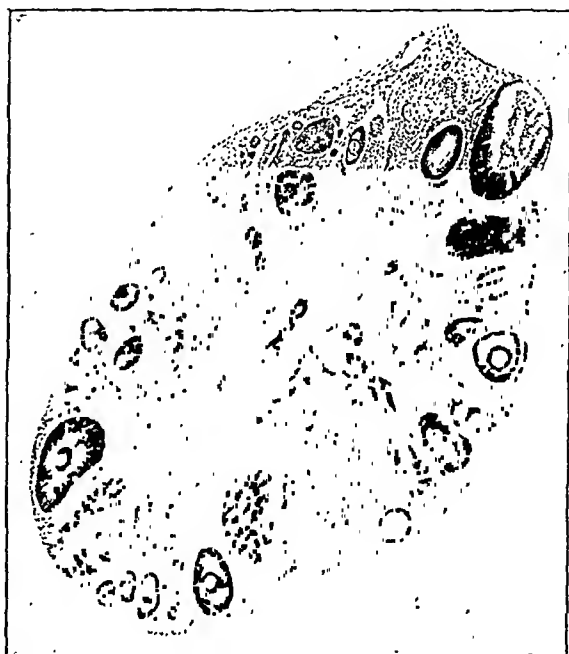


Fig. 5.

Fig. 4.—Cross-section through the control ovary of mouse No. 025 before receiving implant. The ovary is small and atrophic, and contains many primordial follicles, lying in dense stroma.

Fig. 5.—Cross-section through right ovary of same mouse, No. 025, ninety-six hours after implantation, taken at the height of estrus. (Same magnification as Fig. 4.)

The ovary is at least ten times the size of the control (Fig. 4) and is seen to contain many mature graafian follicles with their cumulus oophorae. A marked vascularization of its stroma and the presence of many highly developed corpora lutea is observable as well as a distinct increase of lutein tissue with well-developed interstitial glands.

This rodent was observed from January 17 to April 7 without finding a single estrual cycle. On April 7, it received an implant of anterior hypophysis. On April 9, it was found to be proestrus and, on the following day, a frank estrus was observed, which lasted until the sixteenth. Successive estrual phases were noticed on April 22, 28, May 4, 10, 16, 20, and 28.

During the night of May 28 and 29, the mouse was placed with a young, mature male mouse. Smears were not taken after mating for fear of interrupting gestation,

should one ensue. The animal was killed on June 4, and autopsy disclosed an unmistakable pregnancy in the left horn of the uterus. (See Figs. 4 and 5.)

CLINICAL APPLICATION

Although hypophyseal implants produce these results in small rodents, the effect they would have upon the human is a matter of conjecture. Experiments on monkeys may more closely approximate the results of similar experiments on the human being. Seitz refers to the results obtained in the experiments of Ehrhardt, who was able, by means of implants, to bring about a large, hyperemic uterus in two female monkeys. The ovaries, however, were free from corpora lutea.

In 1927, Ehrhardt and Wiesbader began experiments with human beings. They obtained fresh anterior hypophyseal gland, under sterile precautions, and implanted it in the subcutaneous fat of the adductors of the thigh. In many cases of amenorrhea, occurring in women upon whom various ovarian preparations had been used without effect, the menstrual periods were reestablished. The uterine scraping in these patients, after implantation, showed premenstrual changes and contained glycogen. In one patient with hypophyseal adiposity, who had never been pregnant, secretion from the breasts and swelling thereof was noticed. Many cases were followed up at subsequent laparotomies. In one case, the uterus was slightly enlarged and highly hyperemic, and gave the impression of an early pregnancy. In another case, three weeks after implantation, a large uterus and an ovary, the size of a hen's egg, were found. The latter resembled a degenerated ovary.

Up to the present time, no extract or other preparation of the anterior lobe of the hypophysis has been found, which when injected or taken by mouth has the physiologic effect of the gland implant. It is probable that such an extract would be of the greatest benefit in the treatment of amenorrhea and sterility, and therefore much to be desired.

CONCLUSIONS

1. The ovaries of old, sexually degenerated mice may be used as test objects for the effect of anterior hypophyseal implants.
2. These implants seem to be capable not only of initiating ovarian function in immature mice, but also of reestablishing ovarian activity in old, menopausal mice.
3. Hypophyseal implants apparently possess distinct stimulating properties by reason of the hormones which they contain: they do not continue to grow and produce additional hormones, but their effect upon the activity of the ovary seems to be continued even after their own activity has ceased.
4. It is suggested by these experiments that old, nonestrus mice, when once stimulated, can be kept sexually active for a considerable time without further stimulation.
5. The anterior hypophyseal implants may act by mobilizing the latent, residual hormones of the senile ovaries.

6. In one of the experimental animals, ovulation was restored and succeeded by the gravid state.

7. It is unwise to draw any sweeping conclusions from these experiments until they have been confirmed by others and repeated by us with similar results.

REFERENCES

- (1) *Allen, E.*: Am. J. Anat. 30: 297, 1922. (2) *Aschner, B.*: Med. Klin. 20: 1681, 1924. (3) *Budde, M.*: Franf. Ztschr. f. Path. 25: 16, 1921. (4) *Ehrhardt, C., and Wiesbader, H.*: München. med. Wehnschr. 75: 812, 1928. (5) *Ehrhardt, C.*: Monatschr. f. Geburtsh. u. Gynäk. 80: 176, 1928. (6) *Erdheim, J., and Stumme, E.*: Beitr. Z. Pathol. Anat. U. Z. Allg. Pathol. 46: 1909. (7) *Evans, H. M., and Long, J. A.*: Anat. Rec. 21: 62, 1921. (8) *Evans, H. M., and Long, J. A.*: Memoirs Univ. Calif. 6: 1922. (9) *Frankel, L., and Fr. Chr. Geller*: Berl. klin. Wehnschr. 58: 565, 1921. (10) *Reye, D.*: München. med. Wehnschr. 16: 5453, 1919. (11) *Seitz, L.*: Arch. f. Gynäk. 137: 591, 1929. (12) *Smith, P. E., and Engle, E. T.*: Am. J. Anat. 40: 159, 1927. (13) *Zondek, B., and Aschheim, C.*: Arch. f. Gynäk. 130: 1, 1927. (14) *Zondek, B., and Aschheim, S.*: Klin. Wehnschr. 7: 831, 1928.

(For discussion, see page 320.)

1830 SPRUCE STREET.

Adler, L.: Treatment of Vaginal Discharge. Wien. klin. Wehnschr. 43: 948, 1930.

The sources of vaginal discharge in both the very young and in adults are fully discussed as well as the more common methods of treatment. Altogether too much emphasis is placed on gonorrhea. Under the endogenous form of discharge, ovarian hypofunction, as evidenced by late menarche, irregular menstruation, amenorrhea, oligomenorrhea, and sterility, is stressed. Treatment should be directed toward increasing ovarian function by improvement of the general health, helio- and hydrotherapy, and the use of ovarian and anterior pituitary lobe preparations. Diathermy and X-ray, applied to the pituitary region may also prove efficacious. For local treatment the usual douches, topical applications and bougies are recommended.

Improvement with the dry form of treatment has been found to be transient, and for this reason has been discarded. Except in acute endometritis and pyometra, the uterine cavity is never the cause of discharge, and treatment directed toward it is valueless.

FRANK SPIELMAN.

PERFORATING CHORIONEPTHELIOMA OF THE UTERUS WITH FREE INTRAPERITONEAL HEMORRHAGE*

BY BROOKE M. ANSPACH, M.D., AND JACOB HOFFMAN, M.D.,
PHILADELPHIA, PA.

(From the Department of Gynecology, Jefferson Medical College Hospital)

CHORIONEPTHELIOMA, one of the most interesting of the pelvic tumors, may be looked upon, in a certain sense, as a physiologic process overstepping its normal bounds. The growth of the invasive and destructive cells of the trophoblast, which normally is checked when its function is completed by the nidation of the ovum and the formation of the placenta, becomes unlimited and leads to a widespread destruction of the tissues in immediate relation with the placental site. The continuous proliferation of the chorion epithelium produces a new growth made up of masses of syncytial and Langhan's cells, interspersed with the remnants of the tissues which they have invaded and infiltrated with the blood that corrosion of the blood vessels has set free. A more or less characteristic growth is thus produced, which has a tendency to invade the neighboring vascular channels and rapidly forms continuous local extensions and remote metastases. In the majority of instances the location of the growth is at the placental site within the adjacent layers of the myometrium; its predominant local extension is to the broad ligaments and the vaginal vault and its distant metastases to the lungs. The usual course of the disease is marked in the early stage by uterine hemorrhage, later by a palpable uterine enlargement and, after it has metastasized to the lungs, by cough and hemoptysis. There are many variations of the usual life-history of a chorionepithelioma and these seem to depend partly on accident and partly on the underlying cause of its development. For example, the growth of the syncytial masses and the tumor production may be more extensive in a near-by or in a metastatic area than it is at the original site, producing in this way atypical morbid anatomy and atypical symptoms. Furthermore the growth at the original site or in its local or distant extensions may regress spontaneously and disappear completely. Regression may occur at the original site only, or the tumor at its primary site having been removed by a surgical operation, regression may take place in distant metastases. A spontaneous cure may be laid to the development within the host of a syncytiolysin which is antagonistic to the proliferation of the fetal epithelium and ultimately destroys it.

*Read before the Obstetrical Society of Philadelphia, January 9, 1931.

With this brief résumé of the interesting peculiarities of chorion-epithelioma, we wish to report an atypical form of the disease which possesses a certain individuality and gives rise to unusual symptoms. We refer to a form of chorionepithelioma that perforates the uterine wall, through the serous coat into the peritoneal cavity, causing free and unlimited intraperitoneal hemorrhage and threatening life. It

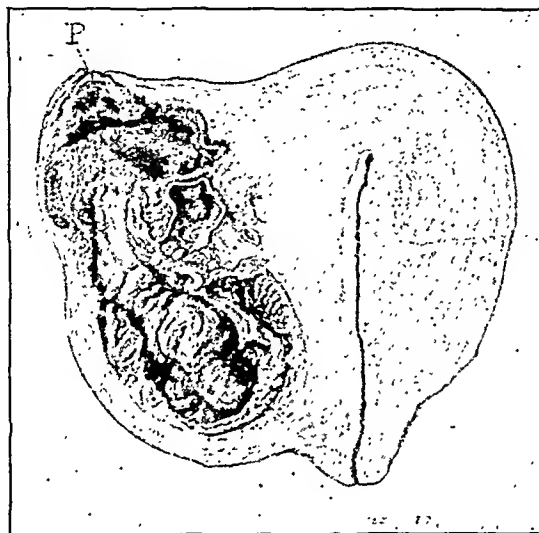


Fig. 1.—Perforating chorionepithelioma of uterus, situated in the anterior wall. No involvement of the uterine cavity; previous left salpingo-oophorectomy. Clinical diagnosis: Tubal pregnancy, ruptured with free intraperitoneal hemorrhage. Questionable early abortion two months before. (From Anspach's *Gynecology*, J. B. Lippincott Co., Philadelphia.)

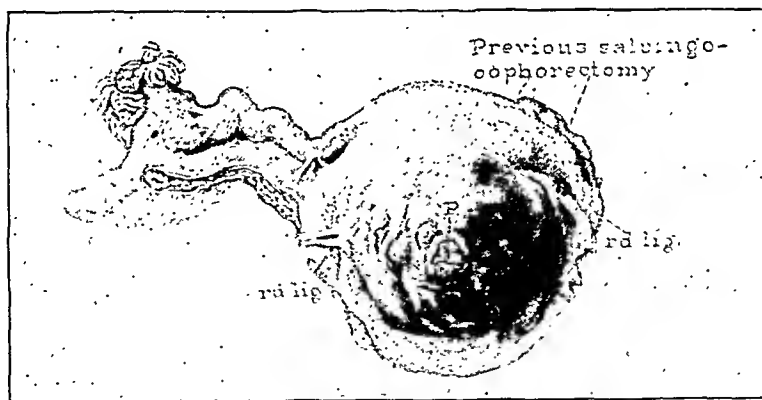


Fig. 2.—Perforating chorionepithelioma of uterus, situated in the anterior wall. No involvement of the uterine cavity; previous left salpingo-oophorectomy. Clinical diagnosis: Tubal pregnancy, ruptured with free intraperitoneal hemorrhage. Questionable early abortion two months before. (From Anspach's *Gynecology*, J. B. Lippincott Co., Philadelphia.)

is by nature quite akin to a tubal pregnancy which ruptures the tubal wall by the corrosive powers of the chorion epithelium and nearly all the cases of perforating chorionepithelioma on record have been diagnosed as ruptured ectopics previous to operation. These perforating chorionepitheliomas are often situated within the uterine wall

and exhibit no communication with the uterine cavity. Of special distinction, therefore, in their symptomatology is the absence of profuse external uterine hemorrhage. It frequently happens that the symptoms are, up to the time of perforation, trivial. The sudden development of a tragic situation at that time and the need for recognition of the true nature of the condition, have led us to report our own case and review seven others found in the literature.

CASE REPORT

History and Clinical Course.—Primipara, twenty-one years old, married four months. The menstrual periods were regular up to the time of marriage. Conception took place immediately thereafter; no periods occurred during the following two months, at the end of which she aborted. From that time on with the exception of one week she "spotted" nearly every day. About two and one-half months after the abortion, the patient was suddenly seized with severe abdominal pain and nausea. In a few minutes she exhibited difficulty in speech, complained of weakness, and sank into a condition of semiconsciousness. A physician summoned during the attack found the woman aphasic and unable to move the right arm or the right leg. On further examination cerebral irritability and dyspnea were apparent. Her pale features and a weak, rapid pulse, suggested an internal hemorrhage. Abdominal palpation disclosed generalized tenderness and signs of intraperitoneal fluid.

The acute onset of the symptoms, the history of spotting for two and one-half months, the blood studies, and the physical findings warranted a diagnosis of ruptured ectopic pregnancy and immediate operation was performed.

The abdominal cavity contained a large amount of free blood. The right tube and ovary were normal; the left tube and ovary were missing (operation several years before). The uterus exhibited a purplish-red protuberance about the size of a walnut on the anterior surface of the fundus. At the summit there was a small perforation, from which blood was flowing into the peritoneal cavity.

As the operative findings suggested a perforating chorionepithelioma, supra-vaginal hysterectomy with removal of the adnexa was performed.

The aphasia and the hemiplegic symptoms accompanying the acute attack were of interest from the standpoint of a possible brain metastasis. After a neurologic and an ophthalmologic study, it was concluded that these symptoms were due to a lesion in the left cerebral hemisphere; whether occasioned by a metastatic focus or a cerebral anemia it was impossible to say.

Following a prolonged convalescence, the patient gradually improved in health and was discharged with instructions to return for x-ray studies and deep roentgen therapy. To our surprise an x-ray picture of the lungs showed a tuberculous lesion. It was not an active one and the patient was discharged in fairly good physical condition after receiving a course of deep x-ray treatments of the pelvis and abdomen.

The hemiplegic symptoms, which this case presented, are of interest because they masked for awhile the true nature of the illness. When such symptoms arise in a young and otherwise healthy woman, after an atypical abortion or the expulsion of a mole, they may be regarded as suggestive, at least, of metastatic chorionepithelioma and the condition of the pelvic organs should be carefully investigated.

It is interesting to note also that two independent conditions coexisted in the same patient, and yet bore no relation to each other. Pulmonary symptoms, like cough and hemoptysis, in such a case, might be attributed either to the tuberculous process or to a lung metastasis.

Pathologic Report.—*Gross:* The specimen consists of an amputated uterus, right fallopian tube, and right ovary. A left salpingo-oophorectomy has been performed previously as is evidenced by the remaining stump. The uterus measures $5 \times 5 \times 4\frac{1}{2}$ cm. The normal contour of the uterus is interrupted by a nodular protuberance on the anterior wall. This measures $3\frac{1}{2} \times 4$ cm., is purplish-red in color and is soft in consistency. The serosa of the uterus is smooth and intact except at the summit of the tumor, where it presents a ragged perforation about 0.4 cm. in diameter. A probe can be inserted easily through this opening into the myometrium.

On incising the uterus through the anterior wall, the uterine cavity is found to measure $3\frac{1}{2}$ cm. in length, and to be lined by a thin, pink uniform endometrium without any gross lesion or break in its continuity of surface.

The myometrium of the posterior wall is of normal consistency and measures $1\frac{1}{2}$ cm. in thickness. The anterior wall is markedly thickened and measures $3\frac{1}{2}$ cm. from the uterine cavity to the serosa. Most of the anterior wall is taken up by a purplish-red, fleshy, friable mass. The growth is separated from the uterine cavity by a thick zone of normal myometrium, and is almost entirely encapsulated by a layer of musculature which separates it from the serosal covering. This capsule gradually becomes attenuated, toward the summit of the tumor, and there disappears at the site of the irregular, crater-like perforation.

The right tube measures 5 cm. in length and its thickness varies from $\frac{1}{4}$ cm. at the inner to 1 cm. at the outer extremity. The serosa presents a few tags of adhesions. The fimbriated end of the tube can be probed to the extent of 1 cm.

The right ovary measures $3 \times 1\frac{1}{2} \times \frac{1}{2}$ cm. The surface is normal. Cross-sections reveal the presence of a few atretic follicles and old corpora albicantia. The ovarian stroma is normal.

Histologic: Sections through the uterine wall, including part of the tumor mass, show the presence of a typical chorionepithelioma. Large herds of Langhan's cells in strand formation are seen infiltrating the muscle fibers. The myometrium contains many large blood channels filled with red blood cells and trophoblastic elements. Large areas of extravasated blood with leucocyte infiltration and necrosis are seen everywhere. Syncytial masses and syncytial wandering cells are observed penetrating deep into the musculature.

A review of the literature of perforating chorionepithelioma with free intraperitoneal hemorrhage shows that it is a rare condition. The following cases have been collected, and are, in many respects, similar to our own.

CASE 1.—Erek, Theodore A., and Outerbridge, George W.

A young multipara, twenty-seven years old, was curetted for a supposed miscarriage and the material obtained suggested hydatidiform mole. Following curettage, her periods became very irregular. A two months' period of amenorrhea then followed, accompanied by morning nausea, and she thought herself pregnant.

Following a vaginal examination, the patient was suddenly seized with violent epigastric pain accompanied by prostration. The abdomen was found to be tender and rigid and signs of severe internal hemorrhage were apparent. The irregularity of the periods, together with the sudden onset of the abdominal symptoms, led to a preoperative diagnosis of ruptured ectopic pregnancy and immediate operation was advised. The peritoneal cavity was found to be filled with blood and blood clots. Both ovaries were moderately enlarged and cystic. The uterus presented several nodular protuberances and an area of erosion. The growth was situated in the fundus and had eroded the serosa without involving the uterine cavity. The perforation of the uterus was responsible for the internal hemorrhage. The malignant tumor had passed through an atypical course and had not been associated

with external hemorrhage. Supravaginal hysterectomy with removal of both adnexa was performed. The patient made a good recovery but on the first attempt at coitus, three weeks after the operation, a profuse external hemorrhage ensued. Examination revealed a metastatic growth in the vaginal vault. Cauterization of the growth increased the bleeding and tight tampon packing was required to control it.

Irradiation with radium was later resorted to with good results: there was regression of the metastatic growth and apparent cure.

CASE 2.—Roulland, H., and Durante, G.

A primipara, forty years old, married one year, was delivered of a dead, macerated, hydrocephalic child. Following delivery, the patient continued to bleed rather abundantly and curettage was performed. For two months following curettage she enjoyed good health. Then again external hemorrhage occurred. The uterus was found to be notably enlarged, and a diagnosis of myoma was made. Three weeks later, she suddenly developed signs and symptoms of profuse intraperitoneal hemorrhage. Emergency laparotomy revealed a perforation of the uterus. At the point of rupture a neoplastic mass was found attached to the fundus. A total hysterectomy was performed. The patient later developed a metastatic growth in the vagina. Death followed three weeks after operation. Histologic examination of the specimen disclosed a typical chorionepithelioma malignum.

CASE 3.—Nagelsbach, Dr. von.

A middle-aged woman, forty-seven years old, was brought to the hospital after sudden collapse. A few hours earlier she had been perfectly well.

One year before, the patient had been curetted for an abortion. Since then her periods had been irregular and toward the last occurred every two weeks. The preoperative diagnosis was uncertain, for although the patient presented symptoms of secondary anemia, these were not sufficiently marked to suspect free intraperitoneal bleeding.

At operation, two liters of free blood were found in the peritoneal cavity. Both tubes were free but the uterus was enlarged. A bloody protuberance was observed on the posterior aspect of the fundus and from it blood was seen trickling steadily into the abdominal cavity. The condition was recognized as chorionepithelioma and a supravaginal hysterectomy was performed. The patient died a few hours after the operation.

The extirpated uterus disclosed a small apple-sized tumor which on cross-section presented a hemorrhagic appearance. The growth took up the greater part of the myometrium, had destroyed some of it, and had broken through the serosa into the peritoneal cavity. The endometrium was free and uninvolved.

Histologically the tumor was found to be a typical chorionepithelioma.

CASE 4.—Hormann, Karl.

A woman aged thirty-eight, para viii, had a period of irregular bleeding that was followed by amenorrhea for four and one-half months. According to her family physician, the patient had given birth to an hydatid mole two years before admission. Pelvic examination disclosed a soft, tender mass on one side of the uterus. The operator thought this was either an extrauterine pregnancy or a pyosalpinx. Soon after the pelvic examination, the patient began to present signs of severe internal hemorrhage and peritoneal shock, followed by collapse. A ruptured ectopic pregnancy was diagnosed and an emergency operation was performed.

On opening the peritoneum, the abdominal cavity was found to contain about 1½ liters of free and coagulated blood. Attached to several loops of the small intestines, a soft tumor about the size of an orange was seen. Another tumor, the size of a walnut was found at the right uterine cornu which gave the impression of an interstitial pregnancy. A supravaginal amputation, with removal of the major part of the growth attached to the small intestines, was performed. Both ovaries

and the left tube were left in situ. Even after this handling of the pelvic organs, the condition was thought to be a ruptured, interstitial pregnancy. The malignant nature of the tumor was not suspected.

Examination of the extirpated uterus gave, grossly, the impression of an interstitial gestation. Incising the uterus disclosed that several parts of it were invaded by hemorrhagic tumors. The main growth was about the size of an orange and was situated at the insertion of the right tube. The point of rupture was found to be a slit about 2 cm. long on the summit of a tumor the size of a pigeon's egg, which was situated at the left tubal cornu.

Histologically, the growths proved to be typical chorionepitheliomas. The patient died six weeks later, with symptoms of secondary growth in the intestines.

CASE 5.—Young, Thomas.

A woman thirty years old, married three years, one child. Two months following the birth of an hydatidiform mole, while urinating, she was suddenly seized with an attack of violent abdominal pain. She became pale and soon lost consciousness. Examination disclosed exquisite tenderness over the uterus. Vaginal examination revealed a small, soft prominence on the right and posterior to the uterus. A diagnosis of ruptured ectopic pregnancy was made. On opening the abdominal cavity, free blood was found. The uterus and both adnexa were removed at operation. On the right fundus of the uterus there was a rounded projection, which, when sectioned, appeared to be encapsulated and composed of dark, red, friable tissue. A small part of the tumor mass projected as a sessile polypoid growth into the fundus of the uterine cavity, near the right cornu. Elsewhere the endometrium was smooth and normal. Situated on the posterior aspect of the left mesosalpinx, near the left cornu of the uterus, a small nodule with an eroded surface was seen. The nodule extended into the mesosalpinx, between the tubes and the ovarian ligament. The growth was friable and appeared neoplastic and seemed to be directly continuous with the growth in the uterus. Histologic examination proved it to be a typical chorionepithelioma. The question was raised by the pathologist, whether the growth in the mesosalpinx was really continuous with the growth in the fundus, or whether it was embolic in character.

CASE 6.—Jacobash.

A young woman, twenty-six years old, para ii, presented symptoms of irregular bleeding for several months. On vaginal examination, the uterus was found too large and irregular. The symptoms of irregular bleeding, together with pelvic findings, led to a preoperative diagnosis of multiple myomas. Two hours following the vaginal examination, the woman developed lower abdominal pain, and collapsed. She died in a few hours with symptoms of internal hemorrhage.

Autopsy disclosed free blood in the peritoneal cavity. Situated on the fundus of the uterus, a tumor the size of an apple was seen. Surrounding this tumor several smaller nodules were found. One of the nodules situated near the right tubal insertion had ruptured and constituted the source of the hemorrhage. The author's diagnosis was *sarcoma telangiectoides hemorrhagicum multiplex uteri*, but, in view of the date of the report and the clinical history and the description of the specimen, Erck and Outerbridge include it in their series. Hormann, who also reports this case, is likewise of the opinion that it should be classed as an example of perforating chorionepithelioma of the uterus.

CASE 7.—Young, Ernest Boyer.

Multipara, twenty-three years old; married three years; one abortion at three months and one full-term pregnancy two years ago. Her periods were regular until the last three months. Since then amenorrhea with symptoms of pregnancy. From time to time during the first month she had attacks of sharp, left, lower abdominal pain. The attacks usually lasted a few hours and disappeared. During the sec-

ond and third months, she experienced no attacks until the end when she was one day suddenly seized with severe generalized abdominal pain, accompanied with vomiting and fainting. She was rushed to the hospital under the diagnosis of ruptured ectopic gestation. On admission, the woman presented signs of shock and acute intraperitoneal hemorrhage. The temperature was subnormal, the pulse weak and rapid. Signs of free blood were elicited in the peritoneal cavity. Vaginal examination revealed the uterus to be enlarged, the cervix soft, and resistance was felt in the vaginal vault. Laparotomy disclosed the abdomen to be filled to overflowing with free blood and laminated clots of blood of different ages. The uterus showed a rupture, situated on a domelike mass, projecting from the fundus of the uterus. In attempting to raise the uterus, a small fetus of about three months popped out from the rent in the uterus. It was at first thought to be a rupture of the uterine end of the tube, but the cornu was found to be intact. As the patient's condition was incompatible with any extensive surgical procedure an elliptical incision was made and the ragged mass excised and the edges sewed together. The excised portion showed the process in the uterine wall to be a perforating chorionepithelioma malignum. Six months later a complete hysterectomy was performed, but the patient died ten days following the operation. No autopsy was performed.

The clinical course of most of the cases so closely resembled a ruptured ectopic gestation that this diagnosis was made five times in the eight cases reported. In three cases uterine hemorrhage previous to the rupture was noted, in three there had been a period of amenorrhea; in two there was spotting. In three cases the tumor involved the uterine wall and the endometrial surface was free, the growth being intramural; in three a similar condition probably existed but the report is not clear; in two the endometrial cavity was involved to a small degree.

It is significant and worthy of note that, in three cases, the acute symptoms arose almost immediately following a pelvic examination. It becomes apparent, therefore, that great care should be taken in making a pelvic examination in suspected cases. As a precaution, such examinations should be made in a hospital if possible.

The symptoms before rupture have been of little or no value in directing attention to the true nature of the condition. Very recently as an important adjunct to the diagnosis of chorionepithelioma, the Aschheim-Zondek biologic test for pregnancy has been utilized. The urine of women with chorionepithelioma or hydatid mole gives a pregnancy reaction about twelve times as strong as a two months' gestation. This test is not only valuable in making the diagnosis but also in estimating the prognosis.

In some cases reported in the literature but not included in our group because details are lacking, no symptoms of an internal hemorrhage were present and yet a perforating chorionepithelioma was found. Aczel reports the case of a primipara, twenty-two years old, who died, exhibiting symptoms of pulmonary tuberculosis. Autopsy revealed a nodular tumor situated in the posterior aspect of the fundus of the uterus with an area of perforation. In this case there had been no clinical symptoms of internal hemorrhage. Extensive metastases were found in the lungs, intestines, vagina, and cervix, all presenting the characteristic picture of malignant chorionepithelioma.

In another case, reported by Zahn, the patient, a woman forty-three years old, para v, presented symptoms rather of intestinal obstruction than of internal hemorrhage and the diagnosis was overlooked even on opening the abdomen. The patient died one hour and fifteen minutes after the operation. Autopsy revealed the uterus to be enlarged and on opening it a soft, highly vascular tumor was found at the left uterine cornu. A perforation was found on the posterior aspect of the uterus, big enough to admit the little finger. Considerable intraperitoneal hemorrhage had taken place with the formation of a retrouterine hematoma. The operator believed the tumor to be a placental polyp, but from the description, it was without much doubt a chorionepithelioma.

CONCLUSIONS

1. Perforating chorionepithelioma most often resembles a ruptured ectopic pregnancy with intraabdominal hemorrhage.

2. The symptoms before the tragic stage may be sufficient to direct attention to the pelvic organs.

3. The immediate cause of the perforation may be some form of traumatism, especially a vigorous, bimanual, pelvic examination.

4. The diagnosis cannot be made with certainty until after the parts have been exposed; the suspected tubes are free; the perforation is at the site of a localized enlargement of the uterine body.

5. The uterus must be removed well below the site of the new-growth, but the acute and profound anemia forbids a complete hysterectomy.

6. The adnexa should be removed with the uterus and subsequent irradiation should be practiced.

7. We wish to mention especially the striking fact, that in at least two of the cases on record, symptoms of cerebral involvement have also been present.

8. It is also to be noted from the case reported by Aezel, that hemoptysis may be a precursor or accompanying symptom of perforation and also may cloud the actual diagnosis.

9. The biologic test advanced by Aschheim and Zondek should be utilized in all patients suspected of chorionepithelioma.

REFERENCES

- (1) *Aezel, Karl*: Monatschr. f. Geburtsh. u. Gynäk. 3: 413, 1896.
- (2) *Aschheim, S.*: AM. J. OBST. & GYNEC. 19: 335, 1930.
- (3) *Erek, Theodore A., and Outerbridge, George W.*: International Clinics 1: Series 25.
- (4) *Ewing, James*: Surg. Gynec. & Obst. 10: 366, 1910.
- (5) *Hormann, Karl*: Hëgar's Beitr. u. Gynäk. 8: 404, 1904.
- (6) *Jacobash*: Ztschr. f. Geburtsh. u. Gynäk. 7: 64, 1882.
- (7) *Nagelsbach, Von Dr.*: München. med. Wehnsehr. 69: 510, 1922.
- (8) *Roulland, H., and Durante, G.*: Paris Chir. 18: 200, 1926.
- (9) *Young, Ernest Boyer*: International Clinics p. 155, 1906.
- (10) *Young, Thomas*: Proc. Roy. Soc. Med. 1912, London 6: 224, 1913.
- (11) *Zahn, F. W.*: Virch. Arch. 96: 28, 1884.

(For discussion, see page 321.)

END-RESULTS IN THE TREATMENT OF CARCINOMA OF THE CERVIX WITH RADIUM*

BY LEWIS C. SCHEFFEY, M.D., AND WILLIAM J. THUDIUM, M.D.
PHILADELPHIA, PA.

(From the Department of Gynecology, Jefferson Medical College Hospital)

THIS report deals with the end-results in the treatment of carcinoma of the cervix with radium as observed in the Gynecological Ward Service of the Jefferson Medical College Hospital under the direction of Dr. Brooke M. Anspach, since September, 1921. Irradiation therapy at that time was rapidly supplanting the radical operation for cancer of the cervix and had been adopted as the exclusive method of treatment in many clinics. While at the beginning of this period it was still felt that operation was the procedure of choice in the earliest cases, the idea was soon abandoned, and since the beginning of the year 1923, no case of cancer of the cervix early or late has been subjected to a radical operation. Our present report has to do with the irradiated cases only. The four operative cases are mentioned to make the analysis of our experience complete, but they are too few in number to serve as a base of comparison as to the relative merits of the two methods.

In submitting our results we have adopted the suggestions of George Gray Ward that statistics upon the subject should be uniform and present certain essential features so that reports from various sources may be easily compared one with the other or the figures added together may enable us to come to conclusions dealing with a larger number of cases.

Ward recommends:

1. "A uniform classification as to the extent of the disease.
2. "Five-year results of total treated cases, early and advanced.
3. "Five-year results of the early cases, that is, definitely confined to the cervix, operable cases.
4. "The operability rate.
5. "The primary mortality."

In addition to these suggestions we have also figured our cures upon the absolute and upon the relative basis as will be noted later.

At the outset it may be noted that from September, 1921, to September, 1930, 150 patients with carcinoma of the cervix were admitted to the gynecologic ward. All but 10 were treated; 2 refused; one died before treatment could be instituted; 7 cases were too far ad-

*Read before the Obstetrical Society of Philadelphia, January 9, 1931.

vanced. Of the 140 cases treated, 63 were taken care of prior to September, 1925, and form the basis of our analysis of five-year cases.

Before proceeding with this analysis we wish to show several tables that we have prepared, dealing with all of our cervical cancer cases and presenting certain features of general interest.

Table I relates to the age incidence and parity. The majority were between the ages of thirty and sixty, about equally divided as to decades, with 30 per cent occurring before the age of forty years. The youngest patient, twenty-two years of age, was treated two and one-half years ago and is living and well; the oldest patient, seventy-nine years of age, died four months after treatment. Six per cent of the patients were nulliparous.

TABLE I. AGE INCIDENCE AND PARITY, 1921-30

DECADE	CASES
20-30	6
30-40	39
40-50	42
50-60	43
60-70	18
70-80	2
Youngest patient	22 years of age
Oldest patient	79 years of age
Parous	141 94 per cent
Nulliparous	9 6 per cent

Table II groups our cases according to the extent of the disease. It follows the classification of Schmitz and is of some interest for two reasons. First, because it shows the advanced type of case that comes to the Jefferson Clinic, there being only 16 in classes one and two (lesion limited to the cervix), an operability rate of 10.6 per cent and second, because the fact is obvious, that patients are not seeking advice at an earlier stage as the years go by. We have chosen the Schmitz classification because we believe it is more conducive to accurate com-

TABLE II. EXTENT OF INVOLVEMENT, ALL CASES

YEAR	CLASS			
	1	2	3	4
1921-22	0	1	21	0
1922-23	1	4	13	1
1923-24	0	0	6	2
1924-25	0	0	9	3
1925-26	1	1	6	4
1926-27	0	0	8	6
1927-28	0	5	17	0
1928-29	0	2	17	2
1929-30	0	1	14	1
	2	14	111	19
Operable		16	10.6 per cent	
Inoperable		130	86.6 per cent	
Recurrent or secondary		4	2.6 per cent	

parison than the terms early, borderline, and advanced. That the judgment of an individual case by different men of the same experience would differ is to be expected. Heyman's well-known example of this factor of personal equation need not be repeated.

Table III gives the present condition of every patient seen from 1921 to 1930. A source of much satisfaction is the success we have had in following up our cases. This follow-up was particularly difficult for the reasons that no systematic plan was adopted until 1927. Every patient has been examined personally by both of us except two; one patient is in England and one patient refused to return but the Social Service worker has paid her a visit. Of the treated patients, 95.7 per cent have been traced (94 per cent of the entire series). We have regarded all of the untraced patients, whether treated or not, as dead. There was one operative death in the entire series, 0.07 per cent.

TABLE III. PRESENT STATUS, ALL CASES, 1921-30

YEAR	PATIENTS SEEN	PATIENTS TREATED	LIVING	DEAD	UNTRACED
1921-22	23	23	1	21	1
1922-23	19	17	2	16	1
1923-24	8	6	1	7	0
1924-25	13	11	5	7	1
1925-26	12	10	1	8	3
1926-27	15	13	3	11	1
1927-28	22	22	8	12	2
1928-29	22	22	10	12	0
1929-30	16	16	9	7	0
	150	140	40	101	9
All patients traced				94.0 per cent	
Treated patients traced				95.7 per cent	
Primary mortality			1	0.07 per cent	

ANALYSIS OF FIVE-YEAR CASES

At the beginning of our work in 1921 we had not come to the conclusion that irradiation with radium was the procedure of choice in every case. During the years 1921, 1922, and 1923, 4 patients were subjected to panhysterectomy, 3 of them having had preliminary irradiation with radium. Two of the patients operated upon died within one and one-half years; one patient received irradiation for recurrence at the end of six years, and died a year later. The fourth patient is living and well, having had a panhysterectomy in 1921 with irradiation for recurrence in 1925, followed subsequently by deep x-ray therapy. (See Table IV.)

Table VI summarizes the results obtained by irradiation. Of the small operable group, two are living and well, seven and eight years respectively. The third case was alive at five but died at seven years of recurrent carcinoma. These results represent a five-year curability

of 100 per cent and a present-day curability of 66.6 per cent. (The eight-year patient had a single radium treatment of 2,400 mg. hours; the living seven-year patient had two treatments, the first 1,200 mg. hours; the second 3,600 mg. hours [ten months later], and subsequent deep x-ray therapy; the patient dying after seven years had a single radium treatment of 3,000 mg. hours.)

Fifty out of 56 of the class three and four groups (inoperable) received radium treatment. Eight lived five years or longer, an absolute five-year cure of 14.2 per cent and a relative five-year cure of 16 per cent. Six of these patients are living and well at present, an absolute pres-

TABLE IV. RESULTS, FIVE-YEAR CASES, HYSTERECTOMY AND IRRADIATION

CASES	FIVE-YEAR CURES	NOW LIVING	DEAD	UNTRACED
4	2—50 per cent	1—25 per cent	3	0

TABLE V. EXTENT OF INVOLVEMENT, FIVE-YEAR CASES, IRRADIATION

YEAR	CLASS 1	CLASS 2	CLASS 3	CLASS 4
1921-22	0	1	21	0
1922-23	0	2	13	1
1923-24	0	0	6	2
1924-25	0	0	9	3
	0	3	49	6

One secondary ease (prior hysterectomy elsewhere)

Operability

5.08 per cent

TABLE VI. RESULTS, FIVE-YEAR CASES, IRRADIATION

	PATIENTS SEEN	PATIENTS TREATED	5-YEAR CURES	NOW LIVING	DEAD	UNTRACED
Operable 5.08 per cent	3	3	3 100 per cent	2 66.6 per cent	1	0
Inoperable 94.92 per cent	56	50	8 14.2 per cent (absolute) 16.0 per cent (relative)	6 10.7 per cent (absolute) 12.0 per cent (relative)	47	3
Total	59	53	11 18.6 per cent (absolute) 20.7 per cent (relative)	8 13.5 per cent (absolute) 15.0 per cent (relative)	48	3

ent-day cure of 10.7 per cent and a relative present-day cure of 12 per cent. (Four of the six living patients received single radium treatments of 2,400 mg. hours; one received 3,600 mg. hours; one received 3,000 mg. hours. Of the patients dying at the end of six years, one received a single 2,400 mg. hour treatment while the other had three treatments in all, 1,200, 500, and 200 mg. hours respectively.

The combined statistics of the operable and the inoperable groups present an absolute five-year curability of 18.6 per cent, with a relative five-year curability of 20.7 per cent. The present-day absolute curability is

13.5 per cent, and the present-day relative curability is 15 per cent.

There was no primary mortality in the five-year group. Of the treated inoperable cases half of the patients died within a year; 7 lived for two years, 3 for three years, and one for four years. About 25 per cent received more than one irradiation. We may point out as a matter of interest that taking into account all cases and all types of treatment, our absolute five-year curability rate is 20.6 per cent, with a relative rate of 22.8 per cent. Considering only patients living today, 14.2 per cent and 15.7 per cent respectively.

COMPARATIVE STATISTICS

Table VII is a grouping of results from various clinics recently published, selected because they admit of a uniform interpretation. All of the reports are in conformity with Ward's criteria.

TABLE VII. COMPARATIVE FIVE-YEAR STATISTICS, IRRADIATION

CLINIC	ALL CASES REPORTED	PERCENTAGE 5-YEAR CURES OF ALL CASES	PERCENTAGE OF OPERABLE CASES WITH PERCENTAGE OF 5-YEAR CURES OF THE SAME
Mayo (Bowling and Fricke)	1094	21.8	2.1 - 60.8
Radiumhemmet (Heyman)	790	20.6	25.5 - 40.4
Mercy Hospital (Schmitz-Hueper)	332	17.5	21.9 - 53.5
Womans Hospital (Ward)	259	24.3	25.9 - 57.1
Rhode Island Hospital (Pitts and Waterman)	92	17.4	20.6 - 57.9
Jefferson Hospital (The authors)	59	18.6	5.0 - 100.0

Several points must be clearly understood. Absolute five-year cures are based on all patients seen, whether treated or not. Relative five-year cures are based on the patients actually treated. Untraced patients are regarded as dead. Attention may be drawn to the fact that a five-year cure does not mean a permanent cure, and we would suggest that five-year statistics should include the percentage of all patients actually living at the time the report is made. (See Table VI.) Deaths occurring after the five-year period should be attributed to carcinoma unless proved otherwise. The question might also be raised whether recurrences under the five-year period, where reirradiation prolongs life beyond that limit, should be regarded as five-year "cures."

A variable factor is the "operability rate." Personal equation cannot be eliminated when the attempt is made to separate cases of cancer of the cervix into operable and inoperable groups. For example; in the report from the Mayo Clinic, and in our own report, the low percentage of operability means either that some borderline cases are excluded from the operable group (Class 1 and 2) or that the advanced

type of the disease is more frequently encountered. The more we restrict the limits of the operable group, the greater will be the proportion of cures in that group and vice versa.

Regarding the relative merits of irradiation and operation, Heyman's collected figures show a somewhat higher percentage of absolute cures for irradiation than for operation. It is to be remembered, also, that irradiation is elected in the more advanced cases and operation in the less advanced ones. When we limit our study to operable cases, irradiation has an advantage of nearly 5 per cent.

It is obviously unfair to compare the proportion of cures from irradiation or from operation in cases that are considered surgically operable, with the proportion of cures that is obtained from irradiation in cases of all types.

TECHNIC AND FOLLOW-UP METHODS

In the group of five-year cases analyzed, the average dose of radium was 2,400 mg. hours, employing capsules of the salt, screened with platinum, silver, or brass, enclosed within a tube of black rubber and placed within the cervical canal, or needles of Monel metal containing the salt plunged directly into the carcinomatous tissue. Gauze packing with plenty of vaseline was placed so as to protect the bladder and the rectum. In recent years, following the suggestion of Ward, a Pezzar catheter has been placed in the bladder. About 25 per cent of the treated cases were reirradiated with radium. Subsequently deep x-ray treatments were not used routinely, because some of the patients seemed to do badly as a result of it. Supplementary irradiation was used only in isolated instances as noted below. In succeeding years, the dose was increased to 3,600-4,500 mg. hours but more recently we have again returned to a smaller dose averaging 3,600 mg. hours. One factor influencing this return to a lower dosage was the occurrence of several fistulas that were probably the result of the larger dose. X-ray treatment has been given in a few cases that at the outset have shown such deep-seated involvement as to be beyond the influence of our radium technic. Arguments for the routine use of the x-ray as an adjunct in treatment seem to be sound ones, contrary to our experience in the past and this plan is favored in certain clinics. Healy has recently advocated x-ray exposures prior to radium application. Ward emphasizes his accomplishments with radium alone, but he also entertains hope for improvement in his results by the use of high-voltage rays in addition, and we are likewise considering this plan.

We agree with Ward as to the advisability of prompt reirradiation at the site of any recurrence. Patients are given regular appointments in the Follow-up Clinic, being seen personally by both of the authors, who have been especially engaged in this work. When a patient fails to keep in touch with the Clinic, the Social Service worker in

the department takes the matter in hand by letter or by personal call. One difficulty that we have encountered has been the frequent change in address of many of the patients. This is probably inevitable in any large city clinic. We have recently asked for the names and addresses of two or more relatives or friends of the patient at her first visit. This frequently facilitates our efforts to keep in touch with them. We regard as very important the personal observation of the patients by both of us as they return, and a persistent effort to have the patient come at regular intervals for examination.

PROGNOSIS FROM THE TYPE OF THE CANCER CELL

It is beyond the scope of this paper to include an analysis of the results obtained with irradiation in relation to the various grades of malignancy into which carcinomas of the cervix and other parts have been divided. We have only recently undertaken this part of the problem, but we hope to make a report upon it some time in the future. In the opinion of Dr. Baxter L. Crawford, Pathologist to the Jefferson Hospital, the gradation of tumors relative to their radiosensitivity has potential promise if one considers the histologic picture in close relationship with the history, gross type of lesion and its clinical course. We are at present employing a simple classification designated as low-grade, intermediate, and high-grade malignancy. This is more or less in accord with Healy's recently expressed summary of the opinion of numerous writers regarding the histology of their cervical cancer cases. It is of interest to note that some of our living patients show the so-called radioresistant type of lesion (low-grade malignancy type). We have not, however, progressed sufficiently with this study to present any definite conclusions.

SUMMARY AND CONCLUSIONS

1. We believe that the essentials suggested by Ward should be adopted as a basis for the standardization of irradiation statistics in carcinoma of the cervix.

2. The Schmitz classification of the extent of the involvement in cervical carcinoma, is in our opinion more desirable than the use of other forms in preparing a statistical review.

3. The number of operable cases, as seen in our Clinic, has not increased from year to year, a discouraging feature when the importance of early diagnosis is considered.

4. Our absolute five-year curability is 18.6 per cent, with a relative five-year curability of 20.7 per cent. The absolute present-day curability is 13.5 per cent and the relative present-day curability is 15 per cent.

5. Our five-year curability in operable cases is 100 per cent with a present-day curability of 66.6 per cent. In the inoperable cases the

absolute five-year curability is 14.2 per cent and the relative five-year curability is 16 per cent. The present-day curability in this group is 10.7 per cent (absolute) and 12 per cent (relative).

6. Our proportion of operable cases was 5.08 per cent.

7. There was no primary mortality in the five-year group.

8. Essentials in a successful follow-up of cancer cases are personal observation of the patients by selected members of the staff, and persistent efforts to have the patients return for examination at regular intervals.

REFERENCES

(1) *Bowing, H. H., and Fricke, R. E.*: Radiology 14: 211, 1930. (2) *Healy, William P.*: Radiology 14: 217, 1930. (3) *Heyman, James*: Surg. Gynec. Obst. 50: 173, 1930. (4) *Pitts, H. C., and Waterman, G. W.*: AM. J. OBST. & GYNEC. 20: 607, 1930. (5) *Schmitz, Henry*: AM. J. OBST. & GYNEC. 14: 580, 1927. (6) *Schmitz, H., and Hueper, W.*: Radiology 14: 223, 1930. (7) *Ward, George Gray*: AM. J. OBST. & GYNEC. 18: 1, 1929. (8) *Ward, George Gray*: AM. J. OBST. & GYNEC. 20: 715, 1930.

(For discussion, see page 322.)

269 S. NINETEENTH STREET,
MEDICAL ARTS BUILDING.

Volpe, Amilcare: Hematocele From Non-Gravid Ovarian Hemorrhage. Arch. ostet. e ginec. 16: 1075, 1929.

The author illustrates a case of hematocele, originating from rupture of the menstrual corpus luteum, in which an extrauterine pregnancy was suspected.

The author sees the cause of the hemorrhage in certain alterations of the ovary and especially of its vessels.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

Volpe, Amilcare: The Process of Healing of Experimental Lesions of the Tube and of the Uterus. Arch. di ostet. e ginec. 16: 933, 1929.

By means of experimental researches on animals the author shows that in the process of cicatrization of wounds of the uterus and tube, the muscular fibers regenerate in such a way as to reconstruct former integrity, however, only if no obstacle, even though aseptic, be present to interfere with this process.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

TUBERCULOSIS OF THE CORPUS UTERI WITHOUT INVOLVEMENT OF THE ENDOMETRIUM*

BY RADFORD BROWN, M.D., NEW YORK, N. Y.

(From the Department of Obstetrics and Gynecology, Columbia University Sloane Hospital for Women)

THIS is the report of an unusual involvement of the uterus by tuberculosis, the process extending directly from the tubes to the myometrium with no apparent intervening involvement of the endometrium. It was an incidental finding in the Pathological Department and not responsible for the symptoms leading up to the patient's admission.

Before Hegar's monograph in 1886, tuberculosis of the genital organs was considered rare. Schlimpert in 3514 autopsies on females found gross tuberculous lesions in 61 per cent; of these 3.4 per cent involved the genital organs. It resolves itself with few exceptions into a study of tuberculous salpingitis. In a series of 200 cases at Johns Hopkins the tubes were affected in 99 per cent; the uterus in 72.6 per cent; ovaries in 33 per cent; cervix in 3.5 per cent; and the vagina in 0.5 per cent. In 68 per cent there was a coincident tuberculous peritonitis.

Genital tuberculosis is rarely primary, the source most commonly being a pulmonary localization. Involvement of the uterus is usually secondary by direct extension from the tubes; also by lymphatic spread from the tubes, or by the blood stream from any site. Involving the uterus this is one of the rare causes of chronic endometritis. The process usually begins as discrete tubercles in the interstitial tissue of the endometrium. These tend to coalesce and become caseous. The lesion is almost always sharply limited to the body, stopping at the internal os and not involving the cervix. With the endometritis there is often an extension into the muscle, a myometritis, the endometrium being destroyed at times, the menstrual function lost, and the uterine cavity filled with the thick, purulent, caseous fluid.

Just how the mode of spread in our case differed from this will be shown in the following report:

J. N., a thirty-nine-year-old, American negress, complaining of pain in the lower right quadrant, of two years' duration, was admitted to the Hospital March 14, 1929.

Menstruation began at the age of thirteen, occurred every twenty-eight days, and lasted for six days. Periods were more profuse in the last few years but there was no intermenstrual bleeding. There was dysmenorrhea beginning two days before the period and lasting throughout. Two pregnancies, one full term ten years ago, and one spontaneous miscarriage at two months, seven years ago.

*Presented, by invitation, at a meeting of the New York Obstetrical Society, January 13, 1931.

Her usual weight was 207 pounds. There was no family history of tuberculosis or cancer. She was in good health until two years ago when she began to have a dull pain in the lower right quadrant. This was intermittent and worse during menstruation. About ten months ago she noticed a small, hard lump above the symphysis; this mass gradually increased in size until admission when she described it as being about the size of an orange. She had no symptoms referable to the lungs, heart, or bladder. Moderate constipation. No loss of weight.

Examination showed a well-developed, obese negress of thirty-nine years, not appearing ill. Head and neck negative; lungs clear; heart negative; abdomen obese. A firm, smooth, tender mass was palpable in the lower abdomen. Pelvic examination showed external genitals and vagina to be normal; cervix small, firm, and not lacerated. The uterus was enlarged to the size of a four months' pregnancy, firm, nodular, and slightly tender. The enlargement was more pronounced on the left side. There was some thickening felt in both adnexa.



Fig. 1.—Low power photomicrograph showing a large tubercle in the myometrium.

Wassermann negative. R.B.C. 4,160,000; Hg. 60 per cent; W.B.C. 9,300; neutrophils 72 per cent. Urinalysis showed a faint trace of albumin. X-ray of the chest revealed slight peribronchial thickening about the hila. There was no evidence of tuberculosis.

Diagnosis was made of fibromyomas of the uterus and chronic salpingitis. On March 15 she was operated upon. The uterus was found to contain several large fibroids; both tubes were enlarged, dilated, and club-shaped. Surface smooth except for dense adhesions. A loop of gut was adherent to the left broad ligament. Supravaginal hysterectomy and bilateral salpingo-oophorectomy were performed.

Pathologic Examination.—Uterus irregularly enlarged by several intramural fibroids. Both tubes were dilated and contained a yellowish viscid fluid. They were densely adherent to the ovaries posteriorly and beneath. The left ovary contained a corpus luteum cyst. Microscopic examination showed typical fibromyomas. The endometrium was moderately thickened. The glands were increased in number

and showed some irregularity in size and shape. They were lined by normal appearing columnar epithelium. The stroma appeared perfectly normal. Besides the fibromyoma the myometrium was found to contain numerous round, oval, or irregularly shaped masses which appeared as typical tubercles. In places these tubercles were discrete while in others they were coalescing. They were found in the outer two-thirds of the myometrium. Some of the sections are from blocks taken as far down in the body of the uterus as halfway between the cornu and internal os. In several sections tubercles were noted bulging into endothelial lined spaces which were possibly lymphatics. Section of the tubes showed a typical hydrosalpinx. Tubercles were found in the isthmic portion from both sides. None were found in the ovaries. The left ovary contained a corpus luteum cyst. Acid fast stain of sections failed to show the presence of tubercle bacilli.

Diagnosis.—Fibromyomas of the uterus; tuberculosis of the uterus; tuberculous salpingitis, nearly healed; glandular hyperplasia of the endometrium; and corpus luteum cyst of the left ovary.



Fig. 2.—High power photomicrograph showing a tubercle bulging into an endothelial-lined space.

The patient's postoperative course was uneventful and she was discharged from the hospital on the sixteenth day. Repeated examination in the follow-up clinic revealed no evidence of tuberculosis elsewhere in the body. She was last seen on October 16, 1929.

Several interesting points are illustrated by this case:

1. The unusual mode of extension of the tuberculous process from the tubes to the uterus, i.e., by the lymphatics to the myometrium, rather than by the usual path through the tubal lumen to the endometrium and thence to the myometrium.
2. The failure to establish a primary focus in the lungs or elsewhere.

3. The tendency to spontaneous cure in genital tuberculosis.
4. The often demonstrated fact that routine pathologic examination frequently brings to light unsuspected tuberculous lesions.

(For discussion, see page 319.)

A NEW FORCEPS WITH A TRACTION CURVE*

By EDWARD H. DENNEN, M.D., F.A.C.S., NEW YORK, N. Y.

(*Instructor in Obstetrics, University and Bellevue Medical College*)

THIS instrument was designed by Dr. E. M. Hawks and myself as a simple, light, fixed axis-traction forceps. The blades are a modification of the Simpson type. They have the long cephalic curve with the tips lengthened, and an exaggerated curve of the posterior lips. The inner surfaces are beveled, simulating the cushion of the Kielland's. The shanks are a modification of those of the Piper instrument. They are bent downward at the middle but are shorter and have a sharper angle. The shanks are continued in the same plane with the blades as far as the bend. The curve in the shank is such that the plane of the handles and adjacent portion of the shanks, when the forceps are applied, is perpendicular to any plane of the pelvis in which the head may lie. (Figs. 1 and 2.)

The advantages of this instrument lie in the two features of prime importance in the forceps operation, viz., application and traction. The long, tapering, cephalic curve is well adapted to a moulded head. The blades fit evenly on the sides of the head with no pressure points and the tips may be anchored well below the malar eminences, thereby preventing slipping. The beveled inner surfaces minimize bruising and cutting of the baby's face and head. The exaggerated pelvic curve of the posterior lips of the blades permits extension over the perineum, with the least amount of pressure on the posterior vaginal walls and sulci. As the blades and adjacent portion of the shanks are in the same plane they are more elastic. This allows accommodation to heads of different sizes and shapes, with the least amount of compression. As a cephalic application is one of the essentials of the forceps operation, these forceps are preferably applicable only in anterior positions of the head. In other positions special types of forceps offer advantages which make them preferable. In posterior and transverse positions of the head in mid-pelvis, the single, accurate cephalic application and semi-axis traction pull with the Kielland forceps favor better results with less manipulation than are possible with manual rotation or with the Seanzoni maneuver. In certain cases, e.g., funnel pelvis or low pubic arch, after rotation has been accomplished, the traction curve forceps may be substituted to secure the advantage of the better pelvic curve,

*Read at a meeting of the New York Obstetrical Society, January 13, 1931.

and of the more pronounced axis-traction. When high forceps seem indicated, the same procedures may be used with one exception i.e., in a flat pelvis with the head in the transverse position and the posterior parietal bone presenting. Here the Barton forceps stand alone as the choice. After the asynclitism has been corrected and rotation completed, the traction curve forceps may be substituted, since the Barton

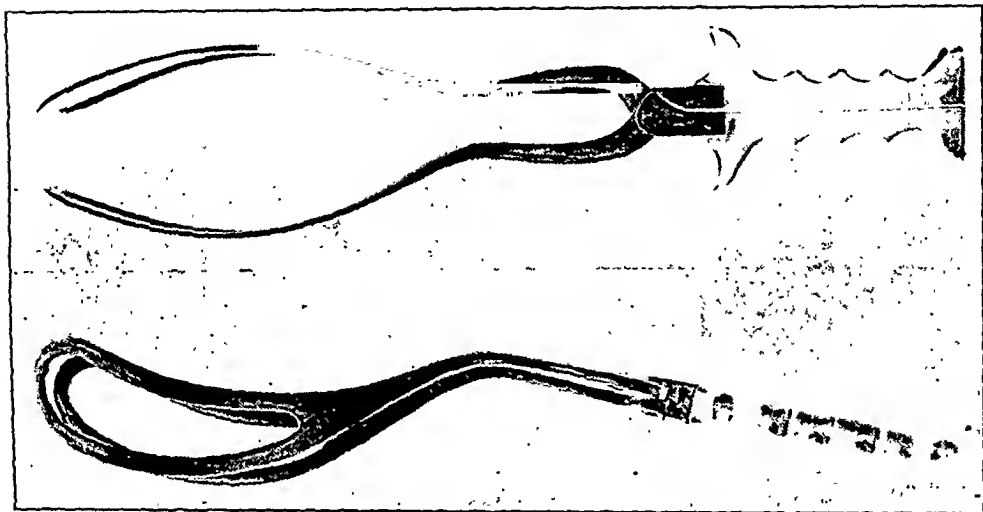


Fig. 1.—Traction curve forceps.

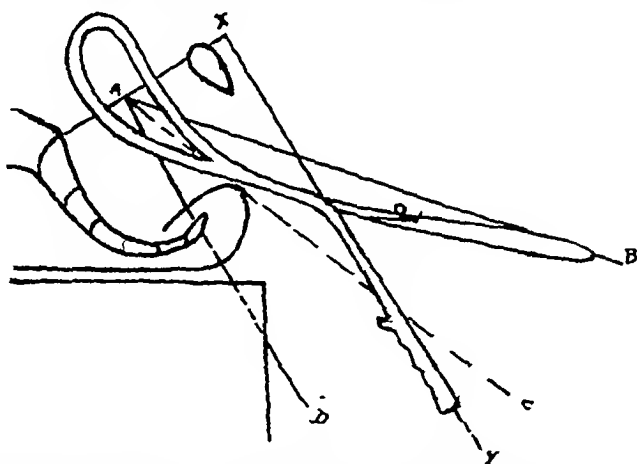


Fig. 2.—Line AB is direction of force applied to classical forceps. Line XY is the plane of handles of traction curve forceps, and is parallel to AD, the true axis-traction. Line AC is the resultant of force applied in the direction of XY.

forceps are not tractors. In some of the more difficult cases it may be wiser to use a heavier axis-traction instrument.

The backward bend of the handles and of the proximal portion of the shanks forms the traction curve, giving axis-traction in all cases. The principle of this curve is an old one. It was used by Morales and by Hubert about the middle of the nineteenth century, and by Galabin in 1877 under the name of a perineal curve. The importance of axis-traction should be emphasized. It determines effort and trauma. To use

the least force one must make traction in the pelvic axis. This is best accomplished in all stations of the head with some form of axis-traction forceps. Even in low forceps it is valuable in obtaining flexion, and in eliminating force wasted against the symphysis. Axis-traction suggests to many a difficult operation with a complicated instrument. For this reason, in the average case, it is often neglected though the advantages are admitted. The classical forceps without axis-traction are frequently used with the maximum force, modified by the Pajot maneuver. Axis-traction, however, automatically tends to keep the force in the plane of least resistance, thereby diminishing the amount of effort and injury.

The technique of application is similar to that of the classical type. Traction is made at the lock and finger guards. The handles rest in the palm of the hand with the middle finger in the space between the shanks. This avoids extra compression of the head from squeezing the handles together, since the principle of a third degree lever is used. Traction is made in the direction of the handles until the heels of the blades begin to distend the perineum. The handles are then slowly elevated with traction until the chin can be reached with the towelled fingers below the anus. Then the forceps are removed. It is true that there is some extra distension of the perineum in primiparae, due to the space between the shanks at the heels of the blades, as is the case with any Simpson type of forceps. This is not considered a disadvantage, as an episiotomy is generally done.

These forceps have been in use two and one-half years on more than 300 cases, of which 201, all that were done in one institution, have been tabulated. There were 26 operators of varying degrees of experience, from the junior intern to the obstetric surgeon. One hundred and sixty-five of the patients were primiparae, and 36 were multiparae. One hundred and twenty-nine were low forceps, and 72 were midforceps. There was no maternal mortality and only one baby was lost. This was an extreme case of asphyxia before the operation was started. Facial markings were extremely rare, and none of them were important. Repeatedly it was found that less effort was necessary for extraction with these traction curve forceps than with the non-axis-traction type by testing the pull of each on the same case.

SUMMARY

1. The instrument described is an uncomplicated, light, fixed axis-traction forceps.
2. It combines several desirable features in one instrument.
3. It is intended chiefly for use on heads in anterior positions.
4. It satisfies the requirements of correct application and traction.
5. Experience has shown that delivery in the average case is accomplished with less effort and with fewer injuries to mother and baby with this instrument than with other types of forceps.

A STUDY OF FIVE HUNDRED BLOOD TRANSFUSIONS

BY W. KEITH BURWELL, M.D., C.M., L.M.C.C., VANCOUVER, B. C.

(From the Clinic of the Woman's Hospital in the State of New York)

THE popularization of blood transfusion in gynecology is of comparatively recent years. Previous to this time the measure was rarely employed, and then only in such cases as extreme anemia with continuous bleeding, and in emergency cases, such as ruptured ectopic gestation, postoperative hemorrhage, and those of incomplete abortion with hemorrhagic shock.

Since 1912, reports of the scientific work of the Woman's Hospital in the State of New York have been published in book form at various intervals. It is interesting to note that blood transfusion found no place in these reports until 1921, and since that time four papers in all have been published. Currier, in 1921, wrote briefly on blood transfusions in a general manner, and gave us an excellent bibliography of over ninety references. Ward, in 1925, emphasized the importance of prophylactic blood transfusions as a routine measure in poor operative risks. In the same year Souter and Duryen (thesis) studied posttransfusional reactions in a series of 190 cases; while Freeman and Vosburgh (thesis) noted the blood pressure changes in 250 cases. Farrar, in 1929, wrote on "Auto Blood Transfusion in Gynecology," described the technic, and rightly emphasized the importance of thorough training of the intern and nursing staff so that emergencies may be handled with ease.

The earliest record of blood transfusion in the Woman's Hospital dates back to 1917 when 2 were given, 1 for ruptured ectopic gestation, and 1 for a severe anemia in the course of a genitourinary infection. In the following year there were 4, 3 for ectopic pregnancy and 1 for a severe anemia. In 1909, transfusions were given to a patient with carcinoma of the cervix previous to radiation, 1 for postoperative sepsis, and 1 for postoperative surgical shock following a complete hysterectomy for chorioepithelioma. In 1920, a patient with ectopic pregnancy was transfused, while in the following year transfusions were not considered necessary. In these cases the amount of blood transfused averages 680 c.c. each. The method recorded in 6 cases was the indirect citrate technic, and while mention is not made of the others, it is reasonable to suppose that the same method was used.

In 1922, great stimulation must have been given to the value of blood transfusions, because in that year 20 patients received transfusions, and it was also in this same year (January 4) that the first

direct method was adopted. It is noteworthy that since that time only rarely have we resorted to the indirect method. In 1923 the number of transfusions increased to 70 and in 1924, to 108; following which well over 100 transfusions have been given yearly in this hospital. The value of such therapy by this time was thoroughly appreciated.

The present study deals with a series of 500 consecutive transfusions given to 382 patients. Two hundred and eighty-three patients received one transfusion; 83, two; 14, three; and 1 (chorioepithelioma), four; and another 1 (cancer of the cervix), five. From these figures it is at once apparent that there was no hesitancy to repeat transfusions; previous apprehension being overcome with increased care in typing.

Too much emphasis cannot be placed on the method of typing and cross typing. In this work the classification and hanging drop method of Moss was used. No patient should be transfused without the serum being cross matched with the donor's cells, and compatibility should not be handed down in less than thirty minutes. Too often we see agglutination of the cells after fifteen minutes or more. Rouleaux formation, while not an evidence of incompatibility, should always be regarded with suspicion, and I believe that it is safer to repeat the test. Such simple procedures call for no additional risk. When transfusions are to be repeated, fresh serum from the already transfused patient must be cross typed with the second donor's cells. It is best to do this even if the same donor is being used on two occasions.

It is interesting to note that our 382 patients do not correspond to the accepted percentages of blood type, these being 33 per cent of Type II, and 18 per cent of Type III. The others agreed with the standard. Three-fourths of our donors were of the universal type, which is easy to appreciate since 45 per cent of all people belong to Type IV, and furthermore because of the universal character of this class. We do not make any attempt to have donors of the same type as the patient.

Blood relatives were used in only one-fifth of our series and auto-transfusion was done on 5 occasions. These do not include those cases reported by Farrar where the autotransfusion was given for the purpose of familiarizing the house staff with the technic.

The amount of blood given seems to be pretty well established at 500 c.c. Of course in cases of shock from severe hemorrhage one may require 750 c.c. or 1000 c.c. All our cases averaged 500 c.c. While less than this amount may stimulate the hematopoietic system equally well; yet the larger amount gives increased benefit without added danger. The influence on the hemoglobin and red blood cell count was studied by taking the blood count immediately before and forty-eight hours after the blood transfusion. Considering all cases to-

gether, regardless of etiology or complications, such as sepsis and the like, we found the hemoglobin was changed from 53.56 to 62.72, corresponding to the erythrocyte count of 3,295,000 and 3,736,000. To obtain a more accurate estimation we had a series of 261 cases where the red cell count was below 3,500,000 and without confusing factors, such as sepsis, bleeding, etc. Here we noted an improvement from 47.06 to 59.38 per cent, corresponding with 2,761,000 and 3,476,000. It is reasonable to believe that further destruction of the infused blood takes place after this period which might lower the calculated benefit somewhat; nevertheless, at this period stimulation of the blood-forming organs is taking place which would offset this added destruction of cells.

In studying the effect on the leucocyte count, it was found that the average count before transfusion was 10,178 and forty-eight hours later was reduced to 9,218. Where sepsis was one of the indications for this therapeutic measure, we found the values lowered from 15,185 to 13,188. If one judges the severity of the infection by the leucocytic estimation, and improvement with the fall of the count, it is reasonable to believe that transfusions are definitely of value here. I have in mind a study of the sedimentation time in such cases. Would it keep pace with the leucocytic count?

In addition to the cellular studies we made note of the temperature, pulse rate, and blood pressure changes occurring two hours and forty-eight hours after transfusion. The temperature curves do not seem to be of much value except when associated with chills. Estimation of the temperature changes was not reliable, as many of our patients were running a fever at the time of the transfusion, some were receiving milk injections, and there were many with a postoperative febrile reaction. Undoubtedly a rise of temperature does frequently occur, exclusive of chills, from the infusion per se; such cases are due to protein sensitization, an anaphylactic phenomenon, and have little or no effect on the picture itself.

Blood pressure changes in our cases were surprising. Considering all cases together we found that there was not any appreciable change in the blood pressure before transfusion as compared with that taken two hours and forty-eight hours after operation, either in the systolic or diastolic readings. Two sets of cases were isolated: in the first group, those with the systolic pressure between 100 and 130—no changes in either readings were observed; and in the second group, those with a systolic pressure of 150 or over, slight changes were noted, the systolic pressure averaging 164, 151, 150 and the diastolic 93, 87, 89. These figures represent the pressure immediately before, two hours after, and forty-eight hours after transfusion.

The pulse rate gave little information. Our figures show a slight

tendency toward lowering of the pulse as noted forty-eight hours after this procedure. No changes were observed in the two-hour interval.

Too often transfusions are given without sufficient indication—a last resort. They serve no useful purpose when given for postoperative shock where blood loss has not been a factor. Such patients will be much more benefited by a gum glucose infusion; especially is this so when the patient is still under the influence of the anesthetic. It is our belief that many lives have been saved by the use of gum glucose. It is of great value and indeed a life-saving measure if used while one is trying to obtain a donor. Canon claims much for this therapy. Blood transfusion on an unconscious patient is always better delayed until consciousness returns, because the patient is not able to give “the danger signal”—signs of incompatibility. We believe it is important to have a hypodermic needle loaded with adrenalin for use in such cases, should untoward symptoms arise. Ninety-nine patients may not need it; the hundredth may. Delay may prove fatal.

The etiology is noteworthy in passing. In a gynecologic hospital one would expect the leading diseases to be myomata uteri (42.2 per cent), incomplete abortion (12.6 per cent), carcinoma (12.4 per cent), hyperplasia of the endometrium (7 per cent), adnexal disease (6 per cent), and ectopic pregnancy (4 per cent). The frequency of other conditions need not be mentioned here.

The indications for transfusion may at first seem confusing with the etiology. Chief among these is anemia. An attempt has been made to divide the anemias into two sections, using as an arbitrary figure an erythrocytic count of 3,500,000. Below this value we considered that the transfusion was given for secondary anemia; whereas above this figure we termed it a “prophylactic blood transfusion” (Ward), attempting to improve the general condition, lessen the operative risk, and speed up recovery. Other indications are numerous; chief among them are: 1, hemorrhage—severe rapid bleeding from any source; 2, anemia of one grade or another with sepsis associated; 3, sepsis; 4, shock (traumatic). This latter indication is best treated with gum glucose; only exceptionally is transfusion indicated.

In the consideration of posttransfusional reactions one is ever mindful of the work of Jansky, Moss, Lewisohn, and Unger in their attempt to eliminate such phenomena. I agree with Drinker, McClure, Dunn, and Sydenstricker that regardless of how carefully the testing may be done, reactions do occur. I have in mind a study of the clotting and bleeding time in relation to transfusions, since it is possible that alterations are produced in this direction which may be responsible for some of the reactions. Drinker and Brittingham brought out this idea. The experimental work of Guthrie and Huch in determining the presence of additional isoagglutinins and isohemolysins in

the blood show the necessity of using fresh serum after each transfusion for cross matching with the donor's cells. Lindeman's contention that such phenomena are due to hemolysis cannot always be proved.

The possibility of changes in the protein plasma by its contact with glassware, rubber tubing, and metal, as a cause of reactions has never been proved. Some claim that fresh rubber tubing is prone to produce reactions, and believe that it should be boiled once or twice before using it. Others believe that larger needles and tubing are to be preferred, on the strength that an apparatus with a small lumen leads to crushing of the cellular elements which in turn promotes reaction. Anaphylactic shock certainly explains some reactions, as many such cases are relieved by the injection of adrenalin or epinephrin. Whether we should study them from the standpoint of immunology is not certain.

In this clinic our reactions are divided into two divisions: a) immediate, occurring within six hours, and, b) delayed, occurring from six to forty-eight hours after the transfusion. Of course reactions do occur later on; such, however, are rare and, in our experience, unimportant. These divisions are subdivided into three classes: 1, single reactions; 2, multiple reactions; 3, thrombophlebitis.

In 500 transfusions there were 270 without any reaction whatsoever. On first examination this seems a relatively small number, but consideration of the single reactions improves the outlook.

Single reactions occurred in 137 patients. Too much importance should not be accredited to them, as many of them would have occurred regardless of the transfusion. Fifty patients complained of headaches of various grades of severity, occurring as frequently in the immediate as in the delayed stage. Twenty-five suffered from immediate chills of an average duration of sixteen and a half minutes, while delayed chills occurred in only 4 cases but were of longer duration—twenty-nine minutes. Chilliness, as opposed to definite chills, is almost as common. Perspiration, nausea and vomiting, and restlessness are infrequent; and, in our patients, diarrhea, urticaria, epigastric distress, backache, and edema of the face were rare symptoms.

Table I shows the incidence of multiple reactions occurring in either period, each case presenting a combination of two or more reactions of which there were one hundred and eighty-two among 72 patients. The average duration of the chills was sixteen and six-tenths minutes in the immediate stage and of twenty-nine minutes in the delayed period. Even multiple reactions must not be overemphasized; rather the operator must stress the significance of intratransfusional reactions which represent immediate incompatibilities. The significance of this factor will be discussed later.

TABLE I. MULTIPLE REACTIONS

TYPE	IMMEDIATE	DELAYED
Headaches	28	26
Chills	27	6
Perspiration	22	11
Chilliness	16	10
Nausea and vomiting	7	7
Restlessness	3	7
Backache	1	8
Diarrhea	0	4
Urticaria	2	1
Edema of lids or face	3	0
Epigastric distress	1	1
Air embolism	1	0

Table II gives percentages to show where possible causes of reactions lie. As one might expect, blood relation plays little part in this connection, which is in contrast to some of the theories expounded in the German literature. It is noteworthy that more multiple reactions occurred with the Scannell apparatus than with the Unger. In our hospital we are using at the present time the Unger needles with the Scannell machine, as we prefer this type of needle. Perhaps the increased reactions with this machine are due to the fact that blood is infused more rapidly with it than with the other, in which case it cannot be blamed. In our hands, the Scannell apparatus is a simpler one, more readily set into working order, and certainly much easier cleaned.

Whether the donor is of the same type as the recipient is in our experience unimportant, notwithstanding that many institutions use donors only of the same type as the recipient. From analysis of our statistics it is apparent that a universal donor does not increase the number of reactions.

Ottenberg, Kaliski, and Freedman were the first to show that where multiple transfusions were given, the recipient developed specific agglutinins and hemolysins against the donor's cells. That immune hemolysins and isoagglutinins are more likely to develop with repeated transfusions is shown by Ottenberg and Libman. Our statistics show that no added danger is encountered when blood transfusions are repeated.

We make it a rule, in so far as possible, to have both the donor and the recipient abstain from food and fluids, except water, for at least three hours before the transfusion. The few cases presented in which this rule could not be carried out show the tendency to increase reactions. There is need for the study of such allergy; the biochemist should help us here.

The place of gum glucose when given before transfusion in relation to the reaction is unimportant. Probably it has nothing to do with such phenomenon. Forty-two of our patients received an average of 325 c.c. of gum glucose before transfusion.

TABLE II. REACTIONS AFTER TRANSFUSIONS

ANALYSIS IN PER CENT	DONOR		METHOD		TYPE		PREVIOUS TRANSFUSIONS			RELATION TO MEALS		GUM GLUCOSE	HEART AFFECTION
	Relative	Professional	Unger	Scannell	Same	Universal	0	I	II	Less than 3 hr.	Before		
Total cases (500)							77.0	19.6	3.0				
100%*	20.2	78.8	70.2	28.8	70.4	28.6							
Reaction	Read across for comparison and down to total												
None 54%	50.5	54.6	55.0	50.7	54.0	53.8	52.8	55.1	81.0	46.4	69.0		53.9
Single 27.4%	30.7	27.4	28.8	25.0	27.2	28.0	28.5	25.5	13.0	46.4	2.4		30.4
Multiple 14.4%	16.0	14.2	11.7	21.5	14.0	15.4	14.8	13.3	6.0	7.2	16.7		13.7
Thrombophlebitis	2.0	0.8	1.4	0.0	0.8	1.4	1.0	1.0	0.0	0.0	2.4		1.0
Others including one death 3.6%	0.8	3.0	3.1	2.8	4.0	1.4	2.9	5.1	0.0	0.0	9.5		1.0
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*The five autotransfusions run in by gravity account for the discrepancy of 1 per cent in adding the totals of the first line. The two instances where the patient had three and four previous transfusions, respectively, are not included in order to simplify the table.

It is not within the sphere of this paper to discuss transfusion in relation to cardiac disease. Most of our patients with cardiac affection had simply a murmur at the apex or base, occasionally slight enlargement, rarely signs of decompensation. Such patients all stand transfusion well. However, when severe cardiac disease is present, it is wise to consult the internist before giving the transfusion.

Four patients developed thrombophlebitis; in 3 it occurred after operation, and in the other case sepsis was present. Summarizing these cases in general, as a detailed description is not pertinent, we note:

1. The ages of 3 were between twenty-five and thirty, the other one was thirty-nine years old.
2. Blood relative donors were used in 2 cases.
3. Unger method adopted in all.
4. Donors all of the same type as the recipient except in 1 instance.
5. One patient with sepsis (pelvic abscess) received two transfusions, developing phlebitis in the right leg after the first and in the left leg after the second transfusion. (No operation.)
6. One patient had preexisting cardiac affection without decompensation.
7. The phlebitis developed from seven to twenty-one days after transfusion, the average being ten.
8. In the 3 operative cases the complication developed from ten to fifteen days after operation. The average being twelve.
9. It seems hardly reasonable to credit such cases of thrombophlebitis to the transfusion. Nevertheless, it must be considered as a possible or predisposing factor.

There were 13 cases where the course of the transfusion could not be followed because death intervened. All were extreme cases where transfusion was given as a last resort and not on a real scientific basis; one had two transfusions, the first being of the auto type. All were suffering from a terminal peritonitis except for 3 cases of surgical shock and 2 from postoperative internal hemorrhage which did not respond to the transfusion.

In 500 transfusions 1 death occurred which we believe was the direct result of the transfusion. It was in a patient forty-three years of age who entered the hospital with an erythrocyte count of 3,000,000 and a hemoglobin of 45 per cent. The patient was a Type III and was given transfusion of 700 c.c. of blood from a universal professional donor which led to an improvement of the red blood cells to 3,500,000 and hemoglobin to 53. Thirteen days later a supravaginal hysterectomy and bilateral salpingo-oophorectomy was performed. At the conclusion of the operation the condition was fair. Nevertheless, it was felt that a transfusion would increase the resistance and hasten convalescence. Although the patient was still under the influence of the anesthetic a transfusion was begun. Near the conclusion of the transfusion slight stertorous breathing was noted, but apparently the

intern did not recognize its importance and continued the transfusion, at the termination of which the pulse suddenly became imperceptible, respirations were slow and stertorous, there was air hunger and the blood pressure was too low to record. Adrenalin was administered without effect and the patient expired. The second donor was a nephew of the Type III group. Autopsy revealed: "pulmonary embolism, atelectasis of the lungs, and fatty degeneration of the liver." This calamity emphasizes: 1, the importance of delaying transfusions until the patient is conscious; 2, the value of gum glucose until consciousness returns or a donor is obtained, and 3, the necessity of interpreting the meaning of intratransfusional reactions. It might have been avoided. One in 500 is only 0.2 per cent, nevertheless it is too often.

CONCLUSIONS

1. Blood transfusion is a safe procedure and only in recent years has it been fully appreciated.

2. When transfusions are to be repeated, it is of the utmost importance to use fresh serum from the already transfused patient for purposes of cross matching with the succeeding donors' cells.

3. Gum glucose infusions are of great value while waiting for consciousness to return or until a donor is obtained, and are more useful than blood transfusions in cases of shock where hemorrhage has not been a factor.

4. Posttransfusional reactions are still to be fully explained, and most important of all are the intratransfusional reactions which are the danger signals and signs of incompatibility.

5. Transfusions may be repeated with safety.

6. While thrombophlebitis occurred in 1 per cent of our cases, it is doubtful whether or not transfusion played any part in its development.

7. The one death might have been avoided if the operator had interrupted the transfusion when the first signs of incompatibility appeared.

FATAL UREMIA DUE TO COMPLETE PROLAPSE OF THE UTERUS

BY ROBERT T. FRANK, M.D., NEW YORK, N. Y.

(From the Laboratories of the Mount Sinai Hospital)

FRORIEP, in 1824, noted damage to the urinary tract due to prolapse of the uterus. He ascribed the dilatation of the ureter to the pressure of the cystocele and to kinking of the urethra.

Virehow, in 1846, described an autopsy on a woman forty-three years old, who died with peritonitic symptoms, following an irreducible prolapse. The lower portions of the ureters were found contracted, the upper dilated. According to Virehow, the condition resulted from prolapse of the trigonum.

Halban and Tandler, in 1907, noted dilatation of the ureter in 15 of 23 cases of prolapse. They believed that the cystocele produced a constriction at the hiatus genitalis and thus compressed the ureters.

Mirabeau, in 1908, briefly recorded that he found dilated kidney pelvis in 3 cases of uterine prolapse, in 3 cases of cystocele without prolapse, and in 5 cases of prolapse of the anterior vaginal wall without cystocele.

Hirokawa, in 1911, reported the findings in 2 autopsies. In the first case in which death was due to pneumonia, the ureters were dilated, the dilatation being most prominent at the crossing of the common iliac vessels. The caliber near the kidney and below the uterine vessels was normal. In the second case a nulliparous woman of seventy came to autopsy, death being due to widespread carcinoma of the breast. The left ureter and kidney pelvis were dilated, the maximum dilatation again being found at the crossing of the iliac vessels on the left side, the right ureter being less dilated. This author believes the compression due to the force exerted by the cystocele, especially that part below the hiatus genitalis. He explains the mechanism as due to pressure of the intraabdominal bladder segment as well as the herniated portion of the bladder in the everted segment of the vagina.

Dilatation of the ureter during pregnancy has been frequently observed and has been ascribed to the increased intraabdominal pressure. (Latzko and Schiffmann.)

Brettauer and Rubin demonstrated dilatation of the ureter by means of pyelograms in patients presenting themselves for operation. They examined eleven women and found hydro-ureter in eight.

In spite of the apparent frequency of ureteral dilatation, serious symptoms ascribable to this cause have but rarely been reported. In a search of the literature I have been able to find a fatal outcome in only two cases, in one of which symptoms were first noted after operation, in the other no history is available.

Sellheim, in 1913, illustrated a condition (his Fig. 10) in which a woman fifty-two years old, para iv, died as the result of an ascending pyelonephritis. According to his interpretation, dissection shows obstruction due to a ureteral kink at the site of entrance into the prolapsed bladder. This figure, however, does not clearly show the site of narrowing.

Young, in 1924, reported the case of a woman, aged fifty-two, who suffered from prolapse after the birth of her first child. She was operated upon for the descensus, but after fifteen years, during which time she had 3 more children, she had an

irreducible prolapse. The specific gravity of the urine was found to be 1.008. There was a trace of albumin. Young performed a plastic operation, the patient dying three days after operation, with suppression of urine. At autopsy the kidneys were found to be small with bilateral hydronephrosis. "The ureters were slightly distended."

I am able to report the following case through the courtesy of Dr. J. Wolff, ophthalmologist to Mt. Sinai Hospital, Dr. G. Baehr, physician to Mt. Sinai Hospital, and Dr. Paul Klemperer, pathologist to Mt. Sinai Hospital.

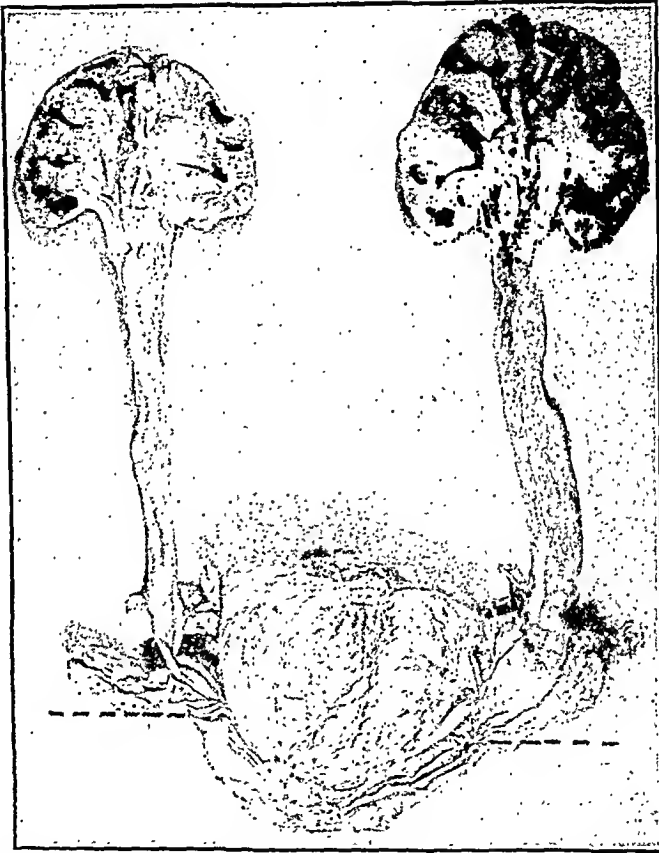


Fig. 1.—Showing the pyonephrotic kidneys and greatly dilated ureters. Below is the bladder laid open. The broken lines indicate the uterine arteries crossing the ureters. Below this level the ureters are normal in caliber.

Mrs. K. R. (Hospital No. 311,745), aged sixty-four, was readmitted to Mt. Sinai Hospital for extraction of cataract of the left eye, for which five weeks previously a preliminary iridectomy had been performed. This patient previously had been suffering from vomiting spells for several years, for which no cause had been found.

Menopause had occurred sixteen years before, and since then a complete reducible prolapse of the uterus existed.

General examination showed unimportant findings except for cataract of the left eye, slight arteriosclerosis, complete prolapse of the uterus with some superficial ulceration of the cervix, and varicose ulcer of the left leg. On February 27, 1930 an extraction of the lens was performed under local anesthesia. From that time on, persistent vomiting occurred.

In spite of appropriate medical measures, uremia developed. On March 9, ten days after operation, anuria set in. The blood urea was 205 mg. to the 100 c.c. The patient died March 18 in spite of all efforts to combat the uremia.

At autopsy, the findings resulting from chronic and acute uremia were noted. Of interest in the present connection was a complete prolapse of the uterus, bilateral pyonephrosis and extreme bilateral hydronephrosis, and dilatation of the ureters. The ureters were tremendously dilated from the kidney down to the point of crossing of the uterine arteries, below which the caliber of the ureters was approximately normal. (Fig. 1.)

The demarcation line between upper dilated ureteral segments and lower undilated portions was so clean cut and sharp that it seemed clear that the tension and compression exerted by the uterine vessels caused the stasis. From the advanced kidney changes noted, it appeared unlikely that reposition of the prolapse would have altered the outcome.

It is surprising, considering the frequency with which ureteral dilatation and kidney damage result from prolapse of the uterus, that serious postoperative consequences are not more frequently observed. It is our present practice to examine the kidney function of every case of prolapse and large cystocle as a routine, by means of the phenol-sulphonephthalein and urine concentration tests with the hope of avoiding operation on patients whose kidney function has been too greatly impaired. Our results from this investigation will be reported later.

REFERENCES

- Brettauer, J., and Rubin, I. C.: AM. J. OBST. & GYN. 6: 696, 1923. *Froriep*: Quoted from Hirokawa. Halban, J., and Tandler, J.: Anatomie und Ätiologie der Genitalprolapse beim Weibe. Braumüller, Wien and Leipzig, 1907, p. 176. Hirokawa, W.: Deutsche Ztschr. f. Chir. 109: 1, 1911. Latsko, W., and Schiffmann, J.: In Halban and Seitz, Biologie und Pathologie des Weibes, Urban and Schwarzenberg, Berlin and Vienna, 1927, V, 4, p. 1234. Mirabeau, S.: Ztschr. f. Gynäk. Urol. 1: 15, 1909. Seltheim: Zentralbl. f. Gynäk. 48: 868, 1924. *Virchow*: Quoted from Hirokawa. Young, J.: Edinburgh M. J., n. s. 31: 207, 1924.

10 EAST EIGHTY-FIFTH STREET.

THYROTOXICOSIS COMPLICATED BY PREGNANCY*

BY ABRAHAM J. FLEISCHER, B.S., M.D., NEW YORK, N. Y.

(*Adjunct Attending Obstetrician, Bronx Hospital*)

BASEDOW'S disease complicated by pregnancy was studied by George Gray Ward in 1909, by Novak in 1912, Beek in the same year, and Seitz in 1913, and many more recent workers. Naturally the point of interest for the obstetrician is what method of treatment should be pursued to the best interests of his patient.

The case which I present to you for discussion is one of thyrotoxicosis complicated by pregnancy. Not infrequently there is developed a thyrotoxicosis during a pregnancy. This form of hyperthyroidism may be entirely secondary to the pregnancy or a latent case of Graves' disease suddenly become activated by the pregnancy.

Mrs. J. M., aged twenty-seven, came to me on August 27, 1930, with a history of amenorrhea for the past six months, and complained of extreme nervousness, sleeplessness, loss of weight, dyspnea, and palpitation. Menstruation began at the age of sixteen, at which time the patient remembers the appearance of a definite enlargement of her neck. The periods were regularly established from the onset, coming every twenty-eight days, and lasting from one to two days with a moderate amount of flow. Her last regular period began on the seventh of January, 1930. Date of expectancy was therefore October 14, 1930. She was a gravida 2, para ii. Her first pregnancy, consummated on June 26, 1926, was marked by the same group of symptoms that she now complained of, in fact the patient thinks they were more severe. This previous pregnancy was followed by a three-day labor, failure of the head to engage, and termination by cesarean section. Her previous medical history, aside from the thyroid disease, and surgical history, was essentially negative. There is no familial history relating to thyroid disease. This is noted in view of the fact, that it is not uncommon for Basedowian mothers to give birth to children who develop exophthalmic goiter.

Physical examination revealed an acutely ill female, short in stature, weighing 110 pounds, with marked exophthalmos and anxious appearance. Von Graeffe and Moebius signs were positive. The teeth were badly decayed. The thyroid gland was markedly enlarged, especially so the isthmus. The lungs were negative, the pulse was 160, a functional systolic murmur was heard at the left base with no apparent cardiac enlargement. The fundus of the uterus was enlarged to the size of a seven months' gravidity, but the fetal heart could not be obtained because of the rapid maternal pulse, although fetal movements and parts were definitely elicited. Aside from the presence of a gravid uterus no further findings were obtained by vaginal examination. The pelvis was of the simple-flat type with a true conjugate of 8 cm. The blood pressure continually remained between 130/70 and 140/80, the urine was normal. Although for the remaining period of her gestation up to the time of her delivery she was continually kept at rest in bed and under the influence of luminal and codeine in combined doses, she nevertheless lost considerable weight, 22 pounds in one month,

*Read before the Bronx Gynecological and Obstetrical Society. Oct. 28, 1930.

notwithstanding a diet rich in carbohydrates and fats with little or no protein content. The latter was excluded because of its specific dynamic action in raising the basal metabolic rate.

This progression of unfavorable symptoms, the marked tachycardia, increasing dyspnea, and loss of weight prompted me to terminate this pregnancy at eight and one-half months' gestation by laparotrachelotomy. Sterilization was accomplished by enucleating the tubes from the cornua of the uterus. Spinal anesthesia preceded by sodium amytal, morphine, and scopolamine, was used. She was continually kept under the influence of morphine and codeine, and received frequent administrations of intravenous glucose for the first four days post-operative. The pulse gradually diminished to a rate of 120, at which point it remained. The dyspnea disappeared, and the patient made an uneventful recovery.

On October 24 she still presented the picture of an active Basedow's disease, although her exophthalmos was not as marked as when I first saw her. The pulse was 120 in rate, but the irritability, anxiety, and palpitation still remained. The basal metabolism before operation was plus 80. Basal metabolism post-operative, was not obtained because of the patient's refusal to submit to the procedure. Four and one-half pounds of the 22 pounds which she had lost, have been regained.

It is perfectly evident that this patient dates back her history of thyroid disease to her beginning puberty. This Basedowian syndrome, already established in her childhood, but in a very mild form, became activated to an alarming degree during her first venture in motherhood. In pregnancy it is not uncommon to find a group of mild symptoms due to an overactive thyroid in the first four or five months. This is a result of the increased demands of pregnancy on the thyroid in the early months; and until the thyroid becomes accustomed to these increased demands, there exists disturbances in its function which are expressed in the hyperirritability, enlarged thyroid, and tachycardia. The basal metabolism may show no change or a slight rise in its rate. Where this apparently benign symptom complex takes on serious proportions, a basal metabolic rate of plus 40 is not uncommon. The rule is for these symptoms to subside and the basal metabolic rate to diminish after the first semester. Beck believes that patients with Graves' disease, whose thyroids have already been functioning excessively before conception occurred, improved subjectively during pregnancy. This he attributes to the absence of the menstrual cycle which in the nonpregnant state is one of the main causes of increased disturbance. It is his opinion that thyroidectomy should be done in the early months of pregnancy only, if symptoms progressively and alarmingly increase. All other cases should be treated medically, subjective improvement occurring after the fifth month, with an uncomplicated labor at term. In 260 cases of Graves' disease complicated by pregnancy, he was compelled to do thyroidectomy only five times, and in no case did he find it necessary to interrupt pregnancy.

In 112 cases of Graves' disease complicated by pregnancy, Seitz found the manifestations of hyperthyroidism were not affected in 40 per cent

of cases. A very small number improved during pregnancy. About 60 per cent were made distinctly worse by gestation. In about one-quarter of this 60 per cent group serious danger to the health and life of the patient ensued. In this group of 112 cases there were 7 deaths, 5 therapeutic abortions, the induction of premature labor in 11 cases, and thyroidectomy performed during pregnancy in 7 cases. Three cases miscarried, 3 gave birth to macerated fetuses, and 3 had premature births. He ascribes the intrauterine death and maceration to toxic influences. He does not consider medicinal or x-ray treatment effective. In the early part of pregnancy he advises dietetic and hygienic measures. Only, if in the later months of pregnancy the subjective and the objective symptoms grow progressively worse, does he admit of an indication to interrupt pregnancy. Together with Ward, Hammerschlag, Riessmann, and Gellhorn, he believes the least dangerous form of intervention to be vaginal section under spinal anesthesia, after the patient had been prepared with scopolamine and morphine; this to the exclusion of bagging, bougie, etc. He advises against marriage, citing the case of the exophthalmic mother having three daughters with Graves' disease. If married, he advises against conception; and if gravid, vaginal section with sterilization.

My own feeling as to the type of section leans rather to the laparotrachelotomy as devised by Krönig and modified by Beck. The rapidity with which this operation can be done under spinal anesthesia is a distinct advantage, thus reducing the time element, enhancing the control of hemorrhage, and substituting a simple operation for one which is not free of technical difficulties and impractical in contracted pelvis.

CONCLUSIONS

1. The essential factors in the antepartum care of a pregnant woman suffering from Graves' disease are:

- (a) Absolute rest, with the use of sedatives if necessary.
- (b) Improvement of hygienic conditions.
- (c) Dietetic correction excluding as much as possible the intake of proteins because of their high specific dynamic action.

2. Where labor is spontaneous, it is advisable to shorten the second stage by the use of forceps.

3. Where it becomes necessary to terminate pregnancy as an emergency measure, the best procedure is laparotrachelotomy under spinal anesthesia, preceded by morphine and scopolamine.

4. Cases of hyperthyroidism which are so severe as to require emergency measures should also be sterilized.

REFERENCES

- (1) Beck, B. F.: Beitr. z. Klin. Chir. 80: 73, 1921. (2) Foster, Nellis, B.: Diseases of the Thyroid Gland, Nelson's System of Medicine 3: chapt. v, 1929. (3) Frank, Robert T.: The Female Sex Hormone, 1929, Springfield, Ill., Charles C.

Thomas. (4) *Gellhorn, George*: Exophthalmic Goiter and Pregnancy, 1913. (5) *Kündmüller, Karl*: Die Basedowsche Krankheit in Geburtshilfe und Gynäkologie, Erlangen, 1918. (6) *Novak, Joseph*: Nothnagel's Spezielle Pathologie und Therapie, Supplementary 7: 1912. (7) *Seitz*: Trans. Deutsche Gesel. f. Gynäk. 1: 213, 1913. (8) *Ward, George G., Jr.*: Tr. Am. Gynec. Soc. 34: 766, 1909; 37: 204, 1912.

2021 GRAND CONCOURSE.

THE DIFFERENTIAL DIAGNOSIS OF ACUTE INITIAL SALPINGITIS AND APPENDICITIS BY MEANS OF A MENSTRUAL SIGN

BY JAMES V. RICCI, M.D., NEW YORK CITY

(*From the Gynecological Clinic of the City Hospital*)

DESPITE the various signs and symptom-sequences that have been suggested as means of differentiation between acute appendicitis and acute right-sided initial gonorrheal salpingitis, the problem still presents sufficient difficulties to account for a diagnostic error in an appreciable number of cases, an error justifiable perhaps, in view of the particular similarity of the symptomatic picture and the spacial proximity of these two organs. The tubal entity under consideration has been designated acute initial salpingitis advisedly, in contradistinction to the acute recrudescences of old inflammatory processes. For it is only in the initial (right-sided) lesions where there has been no palpable tubal enlargement that difficulties of differentiation usually occur. I dismiss from consideration the numerous clear-cut cases where an accentuated symptomatology prevails and renders the diagnosis obvious; nor is it deemed justifiable to consider acute appendicitis in any differential quandary involving pyosalpinx, a tuboovarian abscess, or a rare ectopic; because these entities present tangible physical evidence of the existing pathology under an anesthesia, if not otherwise. And, finally, one can eliminate instances where positive gonorrheal smears from the cervical discharge are sufficiently conclusive and convincing.

In support of this view on differential error, I quote from Polak,¹ who tellingly expressed his opinion in terms of percentages. He stated: "It is sometimes difficult to differentiate right-sided tubal inflammation from appendicitis, for abdominal operation has shown that appendectomy has been performed in 10 to 15 per cent of cases where tubal disease is the existing pathology." And he cautioned that the margin of error would be reduced to a minimum if proper credence be given to a well-taken history, to properly observed physical signs, and to a careful consideration of their sequence. The most striking and convincing proof of the existence of this diagnostic failure has been recently substantiated by Farr and Findlay² in their

absorbing analytical disquisition based on over 500 patients with salpingitis who were operated upon at the New York Hospital. In this large series, 103 cases were erroneously diagnosed, and of these fully one-half, or 53 to be exact, were mistaken for appendicitis. Because of this pronounced percentage of error these authors have devised a differential formula wherein, by substituting known facts and values, an accurate diagnosis may be arrived at. But it must be remembered that though such a schema is available and of value, it is not to be too rigidly adhered to, for the misinterpretation of a symptom, undue appreciation of another, and a lack of consideration of others may cause the whole delicate fabric to crumble, and lead one far from the paths of diagnostic truths.

Of the many diagnostic methods advocated as pathognomonic of these two lesions that we need to take seriously, the majority depend on a particular physical sign, on the blood findings, and on the order of appearances of the various symptoms. In brief:

1. The late Dr. Murphy's³ symptom-sequence: "In appendicitis, there is an acute abdominal pain, most frequently referred to the region of the umbilicus or epigastrium, followed by vomiting, the vomiting consisting of the contents of the stomach. This in turn is followed by local pain, in the region of the appendix, and a slight rise in temperature and pulse."

2. Primrose⁴: "In appendicitis, the maximum point of tenderness is situated at the junction of the upper and middle third of a line drawn from the umbilicus to the right anterior-superior spine. In salpingitis, the point of hyperaesthesia is at the junction of the lowest and adjacent fourth of a line drawn from the middle of Poupart's ligament to the umbilicus."

3. Morris⁵: "Hypersensitiveness on deep pressure at a point about one inch and one-half to the right of the navel indicates appendiceal involvement, whereas increased sensitiveness both to the right and left of the navel point to the pelvis for the source of infection."

4. Hammond⁶: "In appendicitis, accentuated tenderness appears over McBurney's and Morris' point; in salpingitis, the most exquisite tenderness is elicited by pressure over Poupart's ligament."

5. Fischer⁷: "In infections of the tube, the point of greatest sensitiveness lies usually below the interspinal line." And he does not state definitely where the sensitive area is, in appendicitis.

6. Berthomier⁸ quoted by Fischer: "Examination in the left lateral position produces severe pain over McBurney's point in appendicitis, while in salpingitis, McBurney's point is free from pain with the lateral position maintained."

7. Hiescu⁹: "In appendicitis, there is a very painful point on the right side of the neck, located in the middle of the triangle formed by the two heads of the sternomastoid muscle and the clavicle, corresponding to the site of the phrenic nerve. This sign is absent in right-sided salpingitis."

8. Hinkleman¹⁰: The count of an uncomplicated case of appendicitis is that of a polynuclear leucocytosis with a marked reduction of the normal number of lymphocytes. The count in tubo-ovarian lesions is distinctly that of an absolute leucocytosis with both eosinophiles and small leucocytes above the normal number."

Valuable as these methods have proved, their universal application has not availed in the occasional case. Methods which depend on

circumscribed points of hypersensitiveness and on the presence of localized pain on palpation, present their shortcomings, particularly when there is a generalized area of abdominal rigidity. Under these circumstances, these points or areas readily overlap, and, although the localization of Primrose's, Morris', and Hammond's points is certain, their value is doubtful. Ilescu, aware of this undependability, tried to surmount the difficulty by seeking for a more accurate differential sign elsewhere than the enigmatical abdomen. His search led him far afield; and he was able to observe a tender spot on the right side of the neck in cases of appendicitis. But even this aid (according to his notation) melted away with the application of an ice-bag over the appendicular region. Notoriously noncommittal is the leucocytic reaction for differential purposes, since both lesions come within the range of the lowest to the highest counts; and leucocellular gradations depend not on the source of the infection, but on the severity of the bacterial toxicity and the leucocytogenic resistance. Hinkleman's further emphasis of the eosinophilic and basophilic increase and diminution above and below the absolute number is no more enlightening, and not always convincing. The symptom-sequence of the late Dr. Murphy, which he formulated from the study of 2000 cases of appendicitis, is of decided value as a diagnostic adjuvant in the majority of instances; yet it is not the symptomatic response of the atypical cases, and, moreover, it is the actual sequential manifestation of an all-too-frequent right-sided tubal inflammation.

For diagnostic purposes, it can safely be assumed that during an *initial acute attack*, never are both organs simultaneously at fault. The infection is always primary in one of the two structures to the total exclusion of the other. Obviously, a vigorous inflammatory process, given sufficient time, may extend beyond its point of origin, and involve surrounding structures. An acute endosalpingitis, with pus exuding from the tubal ostium may attack a juxtaposed appendix, but the extent of the involvement is limited to the appendicular peritoneum, or the serosa, producing a perityphlitis, and, as such, the appendiceal process remains as harmless as the concomitant perisigmoiditis or perienteritis which occurs in all the more aggressive and prolonged inflammatory tubal lesions. Conversely, an inflamed pelvic appendix may produce a peri-adnexitis, an adhesive reaction with cellular infiltrations of the outer coat; but it never involves the salpingeal mucosa to the extent of a pyosalpinx or a tubo-ovarian abscess. On the other hand, the ravages of a ruptured pelvic appendix are decidedly menacing and compromising. With reference to the combined morbid involvement, Child, in 1919,¹¹ reported an absorbing statistical study, based on 746 cases of adnexal diseases from the records of the City Hospital, in 339 of which the appendix was removed and examined. In this series, the appendix was found micro-

scopically normal in 99 cases and pathologic in 240; it appeared in the pelvis in 75 instances, and, of these, 25 were acutely involved, while 37 showed subacute and chronic lesions. Unfortunately, the author does not state the exact nature of the structural morbidity, whether an actual threatening mucosal appendicitis or a surgically inconsequential perityphlitic.

The collocation of gonorrheal organisms in the endocervix does not necessarily initiate a bacterial ascension of the intrapelvic genital tract. Unlike Bartholin's and Skene's glands, which yield to these germs without a struggle, the healthy endocervix maintains a stout resistance in an effort to attenuate their virulence, stay their course, and destroy them outright. Only in the presence of excessive venery, alcohol, trauma, or debility, in a woman with a supervening menstrual flow, does the ascent begin. In support of this view is a recent report by Kidd¹² of London, wherein he states that out of 142 carefully treated and subsequently observed cases of cervical gonorrhea, only 11 developed adnexal involvement. The gonococcus reaches the endosalpinx either in an attenuated form, exhausted by the cervical encounter, or, it may pass the arbor vitae unscathed. In the former case, there occurs a low grade salpingitis, bereft of initial symptoms save some vague pelvic ache; in the latter, there develops an attack of acute lower abdominal pain with rigidity, temperature, and leucocytosis. But, in both instances, there invariably occurs some derangement in the menstrual cycle, slight and disregarded, or definite and pronounced, depending on the virulence of the toxicant and the severity of the reaction. I hypothesize, therefore, that the presence of the gonorrheal organisms beyond the internal os, strewn over the endometrium and the endosalpinx, upsets the normal harmonic mechanism which controls the occurrence and individualistic regularity of the catamenia. On this factor is based the pathognomonic differentiation between the two lesions, the absence in acute appendicitis, and the presence in acute salpingitis of a disturbed menses. This disturbance, concerned with the time of occurrence, the amount of flow, and the presence of pain, is limited to the last menstrual period preceding or concomitant with the attack of lower abdominal rigidity and tenderness. Pointed questions, and these need be definite, probing, specific, rather than vague, casual and perfunctory, and oftentimes even astute when dealing with a patient who is endeavoring to conceal an indiscreet act—will reveal that the period (in question) was either delayed or occurred sooner than the expected date; that there was either a menorrhagia or an oligomenorrhea; it extended over a longer or shorter period of time; or, that there developed either a premenstrual, comenstrual, or a postmenstrual pain, differing in nature from that of a preexisting, if existing, idiopathic dysmenorrhea. Either one or more of these primary types of disorders invariably precede any acute

initial attack of a salpingeal origin; while in an acute appendix, be it pelvic or an abdominal organ, the catamenia maintains an individualistic norm.

The application of this diagnostic aid necessitates a careful investigation of the patient's previous menstrual history, and a knowledge of what is the normal sequence of events in each particular case. In the occasional instance when the menses are so thoroughly irregular with respect to time of occurrence, amount, and nature of flow, this method of differentiation does not avail. Nor is it applicable in cases of pregnancy, nor in patients past the menopause.

The necessity for an immediate accurate diagnosis between acute appendicitis and acute salpingitis is obviously of extreme consequence when it is realized that the treatment for one condition is antagonistic to that of the other. Whereas acute appendicular lesions demand immediate surgical intervention, operation is categorically contraindicated in the acute tubal processes, the nongynecologic surgeon to the contrary, notwithstanding.

REFERENCES

- (1) *Polak, J. O.*: Pelvic Inflammation in Women. Text, New York, 1921, D. Appleton, p. 142. (2) *Farr, C. E., and Findlay, R. T.*: Surg. Gynec. Obst. 49: 647, 1929. (3) *Murphy, J. B.*: Quoted by Polak, *vide supra*, p. 142. (4) *Primrose, A.*: Canad. M. A. J. 11: 23-26, 1921. (5) *Morris, R. I.*: Am. J. Obst. & Dis. of Wom. p. 80, 1909. (6) *Hammond, F.*: N. Y. Med. J. 111: 978, 1920. (7) *Fischer, H.*: N. Y. Med. J. May 1, 1909, p. 886. (8) *Berthomier, G.*: Quoted by Fischer, *vide supra*. (9) *Iliescu*: Bull. Acad. de Med. Par. 95: 96, 97, 1926. (10) *Hinkleman, A.*: N. Y. Med. J. 118: 569, 1923. (11) *Child, C. G.*: Am. J. Obst. and Dis. Wom. 79: No. 6, 1919. (12) *Kidd, F., and Simpson, A. M.*: Common Infections of the Female Urethra and Cervix, Oxford Med. Series, Text. London, 1921, p. 67.

Tommaselli: A Case of Abscess of the Uterus. Arch. di ostet. e ginec. 17: 198, 1930.

Abscesses of the uterus are not very common. The author describes a case which he feels to be very unusual, because of the enormous amount of pus, about 5 liters, and because of the very rapid and full restitution of the organ. Aside from this perfect regeneration of the uterus in regard to shape, volume, and consistency, it is noteworthy that it also returned to its normal static relations in the pelvis.

The author has doubts as to the etiologic factor, but in this instance might be ascribed to the suppuration of an intramural myofibroma.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

THE POSITION OF THE UTERUS BASED ON A STUDY OF SPINAL-PELVIC RELATIONSHIP*

A STUDY OF 500 CASES

By M. O. MAGID, M.D., NEW YORK, N. Y.

WHILE the human spine has been studied roentgenologically to determine the presence of any anomaly, injury or disease, the paucity of the literature on any study of the relation of the spine to the pelvis from a gynecologic and obstetric point of view is the reason for presenting the results of this study.

The attention of the profession has been called to the different anatomic types among the human race by a number of writers who treated this subject from their own specialistic viewpoint, but a gynecologic and obstetric study of the varied anatomic types has not been reported. This study aims to establish what may be considered the normal relation between the spine and the pelvis, to note the prevalence of any particular variation from the normal, also to observe the position of the uterus in the standard normal type and to compare this with the position of the uterus in the patients who have a variation in the relation of the pelvis with the spine.

Once the attention is called to the existence of varied anatomic types, one can readily observe, in his immediate surroundings, persons who are tall, others who are short; some who are stout and others who are thin. These different individuals have no doubt developed under some varied physiologic influences. A study of the peculiarities of each type may lead to a better understanding of them. The difficulty in these studies, however, is to establish what characteristics shall constitute an individual of the normal type. Once the normal is established, then persons having similar abnormalities may be classed as belonging to a common type. From a gynecologic viewpoint the so-called "abnormalities" will really not be considered as abnormalities, but as normal characteristics of a special type. According to Sturmdorf there are several types of women whom he classified by the consideration of their posture based on the measurement of the depth of the lumbosacral curve, as belonging to the normal, to the exaggerated type or to the infantile flat type.

Cushway and Maier reporting the results of their examination of 931 male spines, state "each spine is characteristic of the individual and he may be identified by a roentgenogram of the spine just as definitely as by a photograph of the face or by

*Read before the Gynecological Section of the New York Academy of Medicine, November 25, 1930.

fingerprints." They report 510 cases with congenital developmental defects, the greatest number occurring in the lumbosacral region, probably due to the fact that this is the last part of the neural arch to close. Just as the individual vertebra may show abnormalities in development, the spine as a whole has been shown to vary with different individuals. The number of presacral vertebrae have been shown to vary, although the human spine usually conforms to a modal type in the majority of cases. Willis says that it is important to note that in spite of a phylogenetic ancestral tendency toward a greater number of thoracic and lumbar segments, man has succeeded in attaining a reduction of the vertebra to a modal number of 17 presacral vertebra in 95.8 per cent of the cases he examined.

The human vertebrae according to Goldthwait have peculiar characteristics which he identifies as coming from a "slender anatomic type" or from a "heavy anatomic type." He describes not only the peculiarities of these vertebrae but also calls attention to the relation of the sacrum to the crests of the iliac bones of these two types. The vertebrae of the "slender anatomic type" have a narrow lateral width and are thicker in the long or vertical axis. The transverse processes are long and slender. The ribs of these individuals are long and slender, having a tendency toward displacement of the diaphragm, forcing the viscera downward, especially if the patient is in the upright position. The sacrum of this type is placed high in relation to the crests, with the appearance of an apparent increase in length of the spinal column. The vertebrae of the "heavy anatomic type" possess a greater lateral width with a lessened thickness of the bodies in the vertical axis. The transverse processes are short and strong. The spines are strongly formed, the tips are broad and override the process below. These processes may be in such close contact that very slight backward bending is possible. The articular processes are crescenting, with vertical axes, allowing very little lateral bending of the body. The last ribs in these cases are either long or short but are horizontal and are heavy in structure. The sacrum in this type is wider and is placed low between the iliac crests. The spinal column is not shorter but the apparent shortness is due to the fact that the last lumbar vertebra is entirely below the level of the considered normal.

Patterson in writing on the human sacrum states that "the surface for articulation with the ilium may be shifted forward, but is more frequently shifted backward." This confirms Goldthwait's observation and one may assume that the lumbosacral articulation will be shifted, depending upon the position of the sacro-iliac articulation. Such changing in the position of the lumbosacral articulation influences the lumbar curve in the spine. In the normal spine the sacrum articulates with the last lumbar vertebra and with the iliac bones so that the upper surface (superior articular process) presents an inclination of about 45 degrees with the vertical. Supporting the torso, head and extremities, the centrum of the last lumbar vertebra rests upon the sloping surface from which it is separated by the interposed fibrous disc. The inferior articular processes of the last lumbar vertebra hook over the superior articular processes of the sacrum and prevent this vertebra and superimposed spine from slipping downward and forward from the articulating inclined plane of the sacrum. If any developmental defect or any defect caused by injury exists in these inferior articulating processes displacement may occur.

Von Lackum in an anatomic study of the lumbosacral region and Hibbs and Swift in a study of the abnormalities of the lumbosacral juncture call attention to a method of determining the lumbosacral angle. This measurement, while it may be obtained by measuring the skeleton, cannot be used clinically. From these studies however we know that the lumbosacral angle varies with the individual and is not only dependent upon the articulation of the last lumbar vertebra with the sacrum but that it is influenced by the tilt of the pelvis, which is the result of the position that the sacrum maintains in relation to the iliac bones. Since the degree

of the lumbosacral angle may be affected by the presence of congenital defects in the vertebrae, by severe muscle strain that is always present in this region and by spinal injury, and since the measurement suggested by von Laackm can only be made on the skeleton, for clinical purposes, it is necessary to have a measurement which, while it is not mathematically perfect, will nevertheless be sufficient to give a clue as to the anatomic type to which the individual belongs.

Since the same factors which influence the formation of the lumbosacral angle also influence the creation of the lumbosacral hollow Sturmndorf suggested that a measurement of the depth of the lumbosacral hollow may be a guide in determining the spinal-pelvic relationship. The present study aims to determine whether the measurement of the lumbosacral hollow showed the existence of any definite spinal-pelvic relationship also whether the spinal-pelvic relationship had any influence on uterine position.

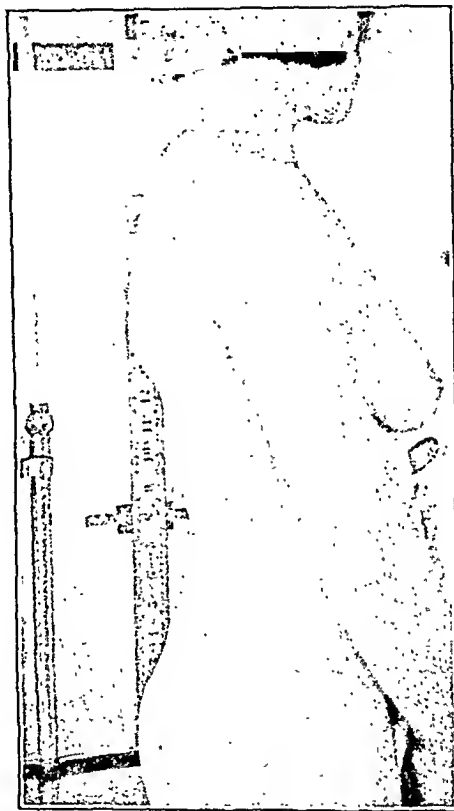


Fig. 1.

In order to take this measurement I devised an instrument which is constructed on the principle suggested by Sturmndorf when he first described the lumbosacral index. This instrument makes the elucidation of this index simpler and obviates some of the shortcomings in the use of the ordinary rules held in position by the hand. It is made up of two metal rules, one 10 cm. long placed at right angles to the second rule which is 60 cm. long. The long rule is fixed perpendicularly on the height measuring rod of a scale. On the long rule there is a sliding device which carries in it the smaller rule in a horizontal position. By a thumb screw adjustment the sliding device with the

horizontal rule may be placed at any height on the perpendicular rule. Before the thumb screw is firmly tightened the horizontal rule can be pushed forward into the depth of the lumbosacral hollow. When the thumb screw is tightened, the two rules are locked in position. To obtain the measurement, the patient stands on the scale in her natural attitude, in her stocking feet, and her back uncovered. The anterior edge of the vertical rule is in contact with the most prominent spinous processes in the dorsal and sacral regions. The reading is taken at

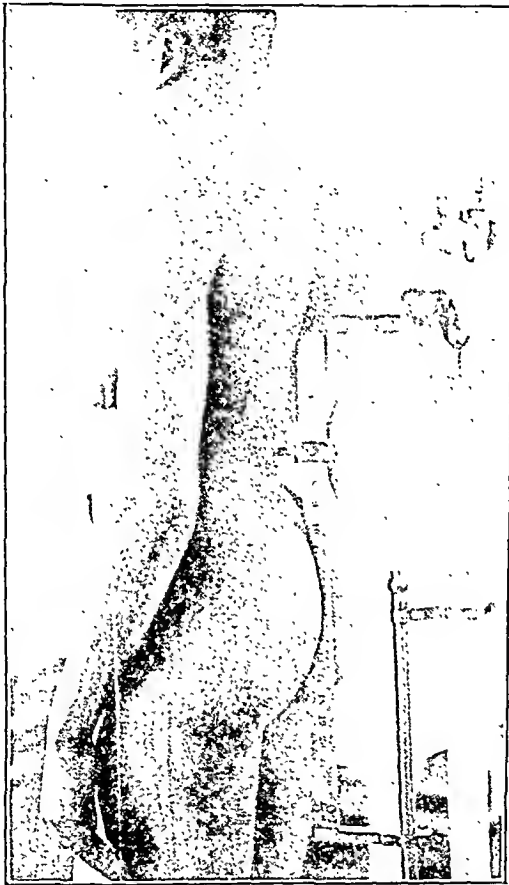


Fig. 2.

the point on the anterior border of the perpendicular rule where it is crossed by the upper border of the horizontal rule on the level of the deepest part of the intervening hollow. The horizontal reading denotes the depth of the lumbosacral curve. The perpendicular reading denotes the height at which the lumbosacral measurement was taken. In addition to measuring the lumbosacral curve, the height, weight, and pelvic measurements were recorded in this large number of cases. A gynecologic examination was also made to determine the position of the uterus, the condition of the adnexa and the pelvic floor.

In this series we have white and colored patients. Some are tall

and thin or tall and stout; others are short and thin or short and stout. In each group we have women who correspond to the "slender anatomic type" or to the "heavy anatomic type" of Goldthwait. These groups respectively correspond to the "infantile" and to the "exaggerated" types described by Sturmdorf. In the "infantile" (slender anatomic) type, the axis of the pelvic inlet is in such relation with the horizon that it forms an angle of about 75 degrees. The pelvis is rotated downward and backward. The measurement of the lumbosacral curve is about 30 mm. or less. In the "exaggerated" (heavy anatomic) type, the pelvis is in relation with the horizon so that the axis of the inlet forms an angle with the horizon of about

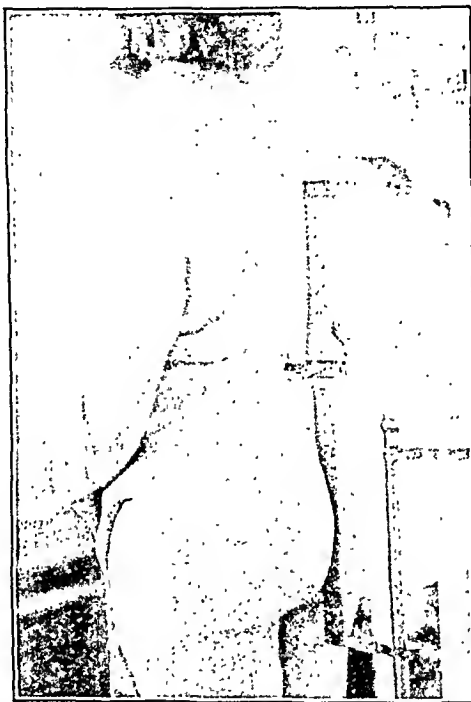


Fig. 3.

35 degrees. The pelvis is rotated downward and forward and the lumbosacral curve measurement is high, about 45 mm. or more.

Just as the position of the pelvis varied in the several types, the uterus was found to maintain a position, in a large number of cases, that corresponded to each type. In the "slender anatomic type" the uterus was found to be retroverted, while in the "heavy anatomic type" the uterus was retrocessed. In the so-called "normal" type, the pelvis being balanced in equilibrium, the uterus was found in the anterior position. The measurement of the depth of the lumbosacral curve in this type is between 30 and 40 mm. In spite of the fact that these types are easily recognized one must bear in mind that each type may have a number of cases that may present a variation

in the position of the uterus. These cases, small as they may be in number, would be considered as the abnormal ones of the type under consideration. In other words, there may be an acquired malposition in the slender anatomic type or in the heavy anatomic type. These cases would bear the same relation to the "abnormal type" as do the abnormally placed uteri that are seen in patients whose spinal-pelvic relation is normal and in whom one would expect to find the uteri in the anterior position.

That spinal-pelvic relation (pelvic tilt), intraabdominal pressure, and integrity of the pelvic floor are factors closely associated in influenc-

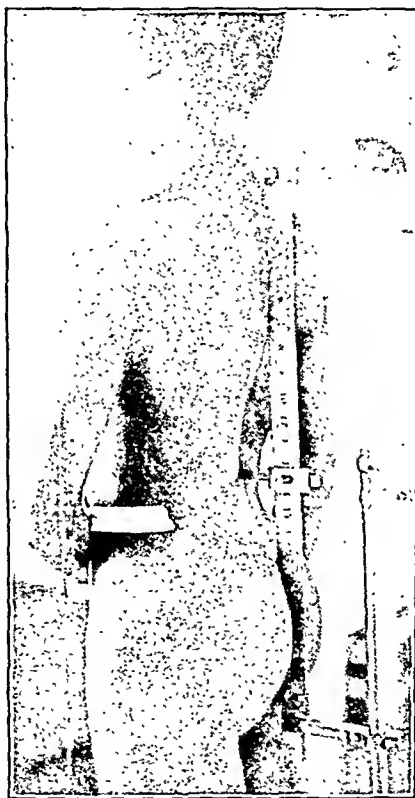
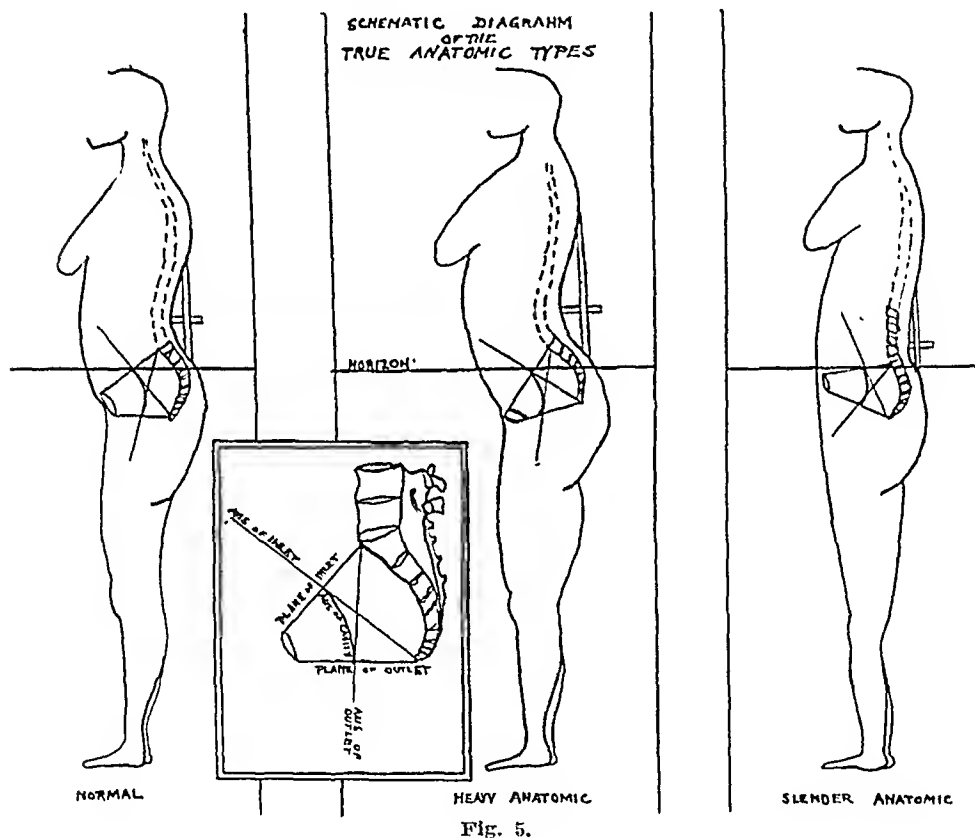


Fig. 4.

ing uterine position, one would expect that the different anatomic types would show a uterine position peculiar to each type. When the force of intraabdominal pressure is exerted in a downward direction, the reaction or angle of deflection will vary in the different anatomic types because of the difference in the pelvic tilt with the associated deflecting areas at the brim of the pelvis peculiar to each type. Sturmdorf aptly explains the action of intraabdominal pressure in these cases by utilizing the law of dynamics—which is, that the direction of a given force or body impelled by such a force, impinging against a given plane, becomes deflected in a fixed and definite manner; the degree of deflection being governed by the angle of the

resisting plane. The difference in the deflecting areas at the brim of pelvis (symphysis) in these types can readily be appreciated by examining the patients vaginally in the erect posture.

Retrodisplacement of the uterus following a pelvic floor injury may be easily differentiated from congenital retrodisplacement by utilizing the measurement of the depth of the lumbosacral hollow. Many of the cases in this series that had retrodisplacement were nullipara with no pelvic floor injury. These patients possessed a stature which placed them in the type or class that is expected to have uterine displacement.



In the general conception of a normally placed uterus the fundus is directed upward and forward and the cervix points downward and backward. The uterus lies in the direction of the axis of the pelvic inlet. It is interesting to read in some textbooks on gynecology, the description of the several positions of the uterus that do not coincide with the "accepted normal standard." The authors describe symptoms that are supposed to exist with each variation in position. Much space is devoted to the etiology and methods of cure. These writings lead to confusion not only of the undergraduate but also the practitioner. In view of many opinions that malpositions per se are symptomless, that if symptoms are present they are due to concomitant disease in the cervix or of the adnexa, it would be much simpler to

consider the subject of uterine position in its relation to the posture of the individual; the posture being dependent upon the lumbosacral relation or pelvic tilt.

In pursuing the study on this basis three positions of the uterus were named: anterior, retrocessed, and retroverted.

1. The anterior position, when the anterior surface of the uterus faces forward and the uterus is placed in the pelvis anteriorly to the axis of the pelvic inlet, and is a short distance from the symphysis pubes.

2. The retrocessed position, when the anterior surface of the uterus faces forward, but the entire uterus including the cervix is placed a varying distance posteriorly to the axis of the pelvic inlet; and the uterus is nearer to the sacrum.

3. The retroverted position, when the anterior surface of the uterus faces upward and the body of the uterus is tilted backward, cervix pointing forward (a) first degree of retroversion; or the anterior surface of the uterus is turned completely backward so that the examining finger in the vagina can easily feel the posterior surface of the uterus (b) second degree of retroversion; or complete retroversion when the fundus is down in the culdesac and the cervix points up to the symphysis (c) third degree of retroversion. These retroverted positions may be congenital or acquired. The latter type is usually in women who have had a pelvic floor injury which causes an interference with the deflection of intraabdominal pressure.

Under the term of congenital retrodisplacement are included the retrocessed or retroposed uterus and the retroverted uterus. In the latter type are also included those cases that have a congenitally long cervix which favors retroversion. The retrocessed uterus was found in women of the "heavy anatomic type." This type has a deep lumbar curve. The sacrum forms an inclined roof from which the uterus is suspended by short sacro-uterine ligaments, placing the uterus higher up in the pelvis or further back toward the sacrum. The vagina in many of these cases is long. The congenitally retroverted uterus is usually present in nullipara or in multipara of the "slender anatomic type." In this type the entire pelvis is rotated downward and backward. After a pregnancy is completed in patients of this type, the uterine will resume the position of retroversion in spite of the fact that pessaries are used with the hope of preventing retroversion from taking place.

The exposition which follows rests on a study of 500 cases with the previously described instrument. The number of cases studied was 542 but it was decided to exclude all cases of patients who had a previous laparotomy for gynecologic disease or those patients who had repair on the cervix or perineum on the assumption that any of these operations might influence the uterine position. The report is therefore on 500 patients who have not had any previous operation. In studying this problem it was interesting to see how a number of similar cases grouped themselves into certain definite types. Allowance was made for the occasional cases that had a slight deviation, therefore some comment about the tables and their numerical values will not be amiss.

TABLE I. SHOWING TYPES OF PELVES

TYPES	WHITE	COLORED
TRUE	Per cent	Per cent
I. Uterus, anterior position, index medium	102 29.48	31 20.13
II. Uterus, retrocessed, index high	85 24.56	46 29.87
III. Uterus, retroverted, index low	50 14.45	18 16.69
SUBTYPES		
(a) Uterus, anterior position, index low	12 3.47	3 .1.95
(b) Uterus, anterior position, index high	23 6.65	25 16.23
(c) Uterus, retrocessed position, index low	20 5.78	3 1.95
(d) Uterus, retrocessed position, index medium	22 6.36	4 2.60
(e) Acquired retroversion	32 9.25	24 15.58
	346	154
Total, True Type, Percentage	68.49	61.68
Total, Subtype, Percentage	31.51	38.28

TABLE II. OBSTETRIC ANALYSIS OF THE TRUE TYPES, WHITE

	NUMBER OF CASES	PREG- NANCIES	TYPE OF DELIVERY		
			SPONTA- NEOUS	INSTRU- MENTAL	CESAREAN
I. Uterus, anterior	36	0			
Index medium	25	1	25		
	4	1		4	
	14	2	28		
	4	2		8	
	7	3	21		
	1	3	2	1	
	1	3	1	2	
	3	4	12		
	2	6	12		
	1	7	7		
	4	1			4
Total	102		109	15	4
II. Uterus, retrocessed					
Index high	43	0			
	9	1	18		
	3	1		3	
	8	2	16		
	2	2	2	2	
	1	3	3		
	1	3	2	1	
	3	4	12		
	1	4	3	1	
	1	5	5		
	1	6	5	1	
	1	6		6	
	1	12	11	1	
Total	85		77	15	1
III. Uterus, retroverted					
Index low	24	0			
	10	1	10		
	4	1		4	
	7	2	14		
	2	2	2	2	
	2	3	6		
	1	3	1	2	
Total	50		33	8	

1. They have been obtained by close personal study made upon individuals in a penal institution, upon patients in private practice and upon patients in a public hospital.

2. That patients of the white and colored races were studied and while the two races cannot be compared, each race has types that may be similarly grouped.

3. These measurements furnish approximate figures that suggest the type, even though a closer study of the individual may show that some variation may be present which may place such an individual into one of the subgroups. Kretschmer in reporting a study on the "Nature of Constitution and Theory of Temperament" states: "The

TABLE III. OBSTETRIC ANALYSIS OF THE SUBTYPES, WHITE

	NUMBER OF CASES	PREG- NANCIES	TYPE OF DELIVERY		
			SPONTA- NEOUS	INSTRU- MENTAL	CESAREAN
a. Uterus, anterior position					
Index low	6	0			
	3	1	3		
	1	1		1	
	1	1	1		
	1	4	2	2	
Total	12		6	3	
b. Uterus, anterior position					
Index high	12	0			
	2	1	2		
	2	2	4		
	2	3	6		
	1	4	4		
	1	9	9		
	1	10	10		
	2	1			2
Total	23		35		2
c. Uterus, retrocessed					
Index low	10	0			
	6	1	6		
	2	2	4		
	1	3	3		
	1	4	4		
Total	20		17		
d. Uterus, retrocessed					
Index medium	13	0			
	3	1	3		
	3	2	6		
	1	2	1	1	
	1	3	3		
	1	6	6		
Total	22		19	1	

e. Acquired retroversion:

1. Cases resulting from previous pregnancies

9 had high index

17 had medium index

2. Cases caused by pathology in adnexa

4 had high index

2 had medium index

Total 32

figures may be regarded only as a provisional halting place but not as statistical constant." The figures in this study should be similarly regarded.

4. Many cases may be found and used as examples against the establishment of the three types. It should be borne in mind, however, that as the result of hereditary or atavistic influences these cases may present mixed characteristics thus accounting for the slight variation from the standard types.

The question which presents itself is—Are the statistical frequencies in this large series of cases, showing types of patients with a certain spinal-pelvic relation and a corresponding uterine position,

TABLE IV. OBSTETRIC ANALYSIS OF THE TRUE TYPES, COLORED

	NUMBER OF CASES	PREGNANCIES	TYPE OF DELIVERY	
			SPONTANEOUS	INSTRUMENTAL
I. Uterus, anterior	11	0		
Index medium	12	1	12	
	6	2	12	
	1	4	4	
	1	5	5	
Total	31		35	
II. Uterus, retrocessed	25	0		
Index high	2	1		2
	6	1	6	
	1	2	2	
	5	3	15	
	3	4	12	
	2	5	10	
	1	6	6	
	1	9	8	1
Total	46		59	3
III. Uterus, retroverted	12	0		
Index low	5	5	25	
	1	3	3	
Total	18		28	

of sufficient number to justify the establishing of the three types previously described? With these facts stated we may approach these figures with an open mind so as to enable us to weigh the pros and cons of the results of the study of the problem that is being presented.

Of the 500 cases studied, 346 were white and 154 were colored.

In this series of cases, patients who belong to the "true retroversion" type had been operated upon to correct the position, with a recurrence in each instance. The patients also stated that they suffered more after the operation for a varying period.

There are also a number of cases in this group that have been informed that because of the "tipped womb," they need not expect ever to become pregnant. These patients later became pregnant and delivered, some spontaneously and some needed instrumental aid. On

the follow-up, these patients showed a return of the retroversion. These patients never complained of anything before or after the delivery. They only became aware of the presence of a "tipped womb" because the physicians apprised them of that fact when they were consulted for sterility.

A study was also made of the height and weight of the patients of both races, to note whether these factors had any obstetric influence.

TABLE V. OBSTETRIC ANALYSIS OF THE SUBTYPES, COLORED

	NUMBER OF CASES	PREGNANCIES	TYPE OF DELIVERY	
			SPONTANEOUS	INSTRUMENTAL
a. Uterus, anterior Index low	3	0		
Total	3			
b. Uterus, anterior Index high	13	0		
	6	1		
	3	2	6	
	1	8	6	
	1	9	8	
	1	1	9	1
Total	25		29	1
c. Uterus, retrocessed Index low	1	0		
	1	1	1	
	1	2	2	
Total	3		3	
d. Uterus, retrocessed Index medium	2	0		
	1	1	1	
	1	2	2	
Total	4		3	
e. Acquired retroversion:	Pathology in Adnexa			
1. Index medium	5	0		
	Resulting from previous pregnancies			
	2	1	2	
	1	3	3	
	1	8	7	1
2. Index high	Pathology in Adnexa			
	9	0		
	Resulting from previous pregnancies			
	3	1	3	
	1	2	2	
	1	3	3	
	1	4	4	
Total	24		24	1

Any height up to 5 feet 2 inches was classed as short; all heights above 5 feet 2 inches as tall. The weight schedule that was followed is the "Average Table of the Weights of Adults." A few pounds variation from the scheduled weight corresponding to the height was allowed in a number of instances. The pelvic measurements were also noted in all cases and the pelvis were designated as small or normal using the accepted measurements as a basis for comparison.

Having thus established that there are different types of women and having shown that these types present a definite position of the uterus peculiar to each type, and that any variation in position of the

TABLE VI

[illegible]

TABLE VII

COLORED	TALL AND NORMAL WEIGHT		TALL AND THIN	C	D	E	F	TOTAL NO. OF CASES		CASES WITHOUT PREGNANCY	CASES WITH PREGNANCY	TOTAL NO. OF PREGNANCIES	N.	S.	TYPE OF DELIVERY			INSTRUMENTAL DELIVERIES						CESAREANS					
	A	B													SPONT.	INST.	CES.	A	B	C	D	E	F	A	B	C	D	E	F
<i>True Types</i>																													
Uterus, anterior	4	6	5	6	7	3	3	31	10	21	32	32	27	4	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Index medium	15	4	12	8	3	4	4	46	25	21	62	62	35	11	59	3	-	1	-	-	1	-	-	-	-	-	-	-	-
Uterus, retrocessed	5	4	1	3	3	2	2	18	12	6	8	8	15	3	6	2	-	1	-	-	-	-	1	-	-	-	-	-	-
Index high																													
Uterus, retroverted																													
Index low																													
<i>Subtypes</i>																													
Uterus, anterior	2	3	7	2	4	7	7	25	13	12	30	30	18	7	29	1	-	-	-	-	-	-	1	-	-	-	-	-	-
Index high	-	-	4	-	-	-	-	4	2	2	3	3	4	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uterus, retrocessed	-	-	-	-	-	-	-	3	1	2	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Index medium	-	-	3	-	-	-	-	3	3	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uterus, retroverted	1	3	7	3	-	1	1	15	9	6	12	12	11	4	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Index high	2	1	3	-	3	-	-	9	5	4	13	13	8	1	12	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Index medium																													
Total	29	24	42	22	20	17	17	154	80	74	163	124	30	156	7	0	1	1	1	1	1	2	2	1	1	1	1	1	1

uterus should be considered in its relation to the pelvic tilt, one feels justified in agreeing to the comment made by the Editors of the Year Book in Gynecology and Obstetrics (1928)—“Another operation for the correction of retroversion, added to the already crowded field. Apparently human ingenuity must have an outlet and woman is the sufferer.”

In those cases where the operation for retroversion failed, the technique of the operation or the surgeon's skill was not at fault. The bad result was due to the fact that the surgeon failed to appreciate the type of patient he had in hand. Those patients who had congenital retroversion should not have been operated upon. Those patients with acquired malposition are cured, and may be cured by any corrective operation if in addition to the abdominal operation the pelvic floor is properly repaired. The reason for the numerous operations for the cure of malposition is the desire of the surgeon to develop an operation that he hoped would accomplish what the previously existing operations failed to do.

In appreciating the relation of the spine to the pelvis one will be able to account for the existence of the “tipped womb” in nullipara as well as in many multipara. He will not recommend surgical or mechanical correction in these cases. He will understand the reason for the statement that “arched back” is associated with difficult labor. He will also be able to decide whether attempts should be made to prevent malposition of the uterus by the use of pessaries soon after childbirth.

In conclusion I wish to call attention to the following:

1. That there are certain types of women who present anatomic relations between the spine and pelvis that are at variance with the majority of women, and that the uterus assumes a position which is essential or normal to these types of women.

2. The “normal standard” has been accepted only because a large majority of the women are constituted in their physical make-up in a similar manner.

3. Many women who possess a variation in position of the uterus from the “standard normal” of the majority of their sisters, are perfectly normal to themselves. These women conform to a “standard of the minority.”

4. That any attempts to correct these variations in position in order to make them conform to a “standard-so-called normal” with the hope of relieving symptoms, will result in failure or may produce new symptoms.

5. While the measurement of the depth of the hollow of the lumbar spine, is not mathematically an exact index, it does serve as a guide in determining the pelvic tilt, with the corresponding uterine position in the several types of women.

6. Uterine position is not a factor to be considered in trying to determine the cause of sterility.

7. From an obstetric viewpoint, the relation of the pelvis to the spine is no doubt a factor to be considered, but other factors such as the size and position of the fetus and the expulsive power of the uterus must also be borne in mind. While "arched back"—heavy anatomic type—patients are of some concern to the obstetrician because the axis of the pelvic inlet is almost at right angles to the perpendicular line of force of intraabdominal pressure, thereby influencing the presenting part at the brim of the pelvis, favoring posterior positions, in this study the number of instrumental deliveries in the heavy anatomic type is comparatively small.

8. That the results of this study have been obtained by personal observations in a fairly large series of cases. If by reporting these observations, others will be stimulated to further research of this problem, with the ultimate result of sparing patients from unnecessary operations, then this task will not have been in vain.

REFERENCES

- (1) *Patterson*: Proc. Royal Soc. 51: 520-24, 1892. (2) *Mills, R. W.*: Am. J. Roentgen. 9: April, 1917. (3) *Gynoplastic Technology*, Arnold Sturmdorf, 1919. (4) *Goldthwait, Joel E.*: Orthopedic Surg. July, 1920. (5) *Willis, Theodore A.*: Am. J. Anat. 32: 95, 1923. (6) *Foster, G. S.*: Uterine Malpositions. Editorial Comment, Obstetrics and Gynecology, Year Book, 1928. (7) *Cushway and Maier*: J. A. M. A. 92: 701, 1929. (8) *Kretschmer, Ernest*: Physique and Character, 1926, Harcourt, Brace & Co.

982 WHITLOCK AVENUE.

Conill, V.: Contribution to the Study of Tumors of the Tube. Rev. Espan. de obst. y ginec. 14: 335, 1929.

The author describes a primary epithelioma of the tube which he discovered while performing a hysterectomy for fibroids and pseudomucinous multilocular ovarian cyst. The tumor was composed of embryonal epithelial cells arranged in the form of solid cords surrounded by young connective tissue. There was no evidence of a previous inflammatory process.

FRANK SPIELMAN.

PELVIC DIATHERMY*

BY GEORGE GELLHORN, M.D., F.A.C.S., ST. LOUIS, MO.

THE results obtainable with diathermy have been subjected to considerable discussion. There are some who pronounce them wholly imaginary while others, equally uncritically, claim that they have cured almost any ailment with this method. Even those whose judicious attitude and personal experience entitle them to earnest consideration, feel that "it is impossible to focus the site of heat in any given internal viscus" or entertain "grave doubt" as to "the possibility of raising the temperature 5 to 10 degrees."²

Yet, the production of a high degree of heat in a given location within the body constitutes the very nature of diathermy. Therein lies its essential difference from either contact or radiating heat both of which are applied *from without*. A high frequency current of low voltage, by passing through the body or certain parts of it, transforms its electric energy into heat because of the resistance of the living tissues. The localization of heat is determined by the uneven size of the electrodes, for the current flowing from a larger to a smaller electrode, heats the tissues through which it travels, particularly in the neighborhood of the smaller electrode because here the current converges and, becoming denser, increases proportionately in heating power.

This can best be demonstrated in gynecologic diathermy where the outer or "indifferent" electrode of block tin is placed around the waist of the patient while the smaller electrode is inserted into the vagina. Of the various models I have found the Chapman vaginal electrode particularly useful because it snugly surrounds the cervix and completely fills the vaginal fornices. A diagram (Fig. 1) demonstrates that the electric current entering at *a* must needs seek its way through the body to the vaginal electrode *b* and attains its greatest density in the uterus and its appendages. It is an extremely simple matter to prove that the electric current produces considerable heat and that the highest degree of the latter is localized in the uterus and its immediate vicinity. It is only necessary to place a thermometer into both bladder and rectum during the abdominovaginal treatment. I have done this systematically in a large number of cases. I have also carried out these experiments in different hospitals so as to check up my findings, and though the maximum temperature varied somewhat with different makes of diathermy apparatus, the ratio be-

*Read, by invitation, before the American Congress of Physical Therapy, St. Louis, September 8, 1930.

tween the temperature in the vagina and that in bladder and rectum, respectively, was practically the same. As an illustration, I submit Table I.

Table I, to my mind, is very instructive. It proves at once that it is possible to raise the temperature in the pelvis 10 or more degrees, to maintain it at this level and to focus the heat within the uterus and parametria. Here is the peak of the heating process, for in the adjoining organs, though their actual distance is hardly more than 2 or 3 cm., the temperature, on an average, is 1° or 2° lower than in the center. The difference is more marked in the bladder, perhaps because the urine is not a good conductor of heat.

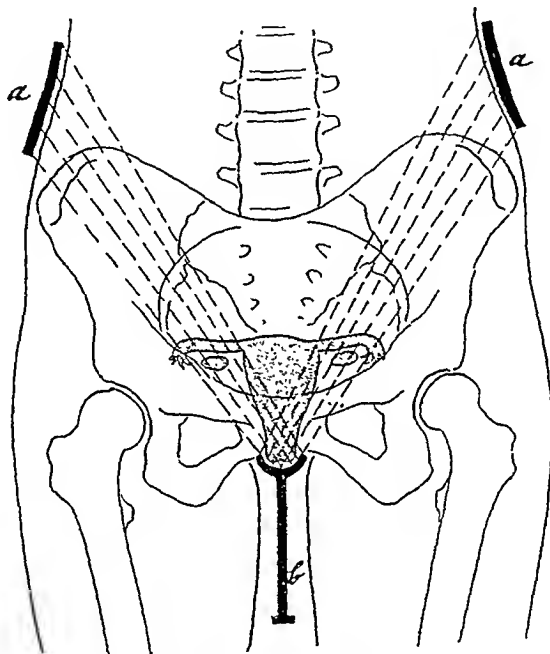


FIG. 1.—(Redrawn from Guthmann.)

Even if the apparatus at present on the market, were able to produce a temperature of 115° in the vaginal electrode, it was considered inadvisable to exceed 112° lest the living cells suffered irreparable harm. This degree was quite sufficient to produce a distinct sensation of internal warmth which, in some cases, even led to profuse external perspiration. The part of the body, on the other hand, which was covered by the outer, indifferent electrode, was neither reddened nor heated.

The heat created in the organs and tissues in the pelvic cavity primarily acts as a stimulant upon the vasodilator nerves within the affected zone. As a result, the blood vessels dilate, and into these vessels rushes a large wave of fresh arterial blood. This serves, in the first place, to cool the tissues and prevent burns and, secondly, to wash away the waste products of former inflammations. The local metabo-

lism which had been retarded by the existing pathologic condition, is thereby restored more nearly to the normal. The new blood may, as Schefly and Schmidt remark, bring additional leucocytes and anti-toxins with it and neutralize bacterial poisons. Absorption and elimination are intensified, and a partial expression of this process is the profuse watery discharge which follows every treatment. Pressure upon nerves by venous stasis is lessened, and this explains the relief from pain which, in most cases, is a prompt and impressive phenomenon.

The possibility, then, of creating internal heat within the pelvic organs and thereby inducing a powerful arterial hyperemia in these

TABLE I. INTERNAL DIATHERMY (VAGINAL)

<i>Treatment No. I. Temperature</i>				
TIME	MILLIAMPERES	VAGINAL	RECTAL	VESICAL
11:35	1500	102° F.	101.2° F.	100.6° F.
11:40	2500	106° F.	105.4° F.	104.0° F.
11:45	3000	108° F.	107.2° F.	106.2° F.
11:50	3000	110° F.	109.0° F.	108.0° F.
11:55	3200	110° F.	109.2° F.	108.0° F.
<i>Treatment No. II. Temperature</i>				
TIME	MILLIAMPERES	VAGINAL	RECTAL	VESICAL
11:25	2400	106° F.	105.2° F.	104.0° F.
11:30	2500	108° F.	106.2° F.	105.0° F.
11:35	3000	110° F.	107.4° F.	106.2° F.
11:40	3000	110° F.	108.0° F.	107.0° F.
11:45	3200	110° F.	109.0° F.	108.0° F.
<i>Treatment No. III. Temperature</i>				
TIME	MILLIAMPERES	VAGINAL	RECTAL	VESICAL
2:50	1200	103° F.	100.0° F.	99.8° F.
2:55	1500	106° F.	103.0° F.	102.0° F.
3:00	2000	108° F.	104.4° F.	103.2° F.
3:05	2500	110° F.	106.8° F.	105.0° F.
3:10	2500	110° F.	109.4° F.	106.8° F.
3:15	3000	112° F.	110.0° F.	109.0° F.

NOTE. No temperatures were recorded until the patient had been under treatment for ten minutes.

structures points to diathermy as a promising method of treatment of pelvic inflammatory disease and superior to other forms of heat application. I may refer here to a previous article³ in which I have discussed this aspect of the question at length.

I cannot, however, leave the subject without pointing out the limitations of this form of therapy. The possessor of a diathermy apparatus should bear in mind that heat and hyperemia are powerful agents which may be as harmful as they are beneficial if used judiciously and in moderation. Therefore, he should be absolutely certain of his diagnosis before using diathermy, even if it should require consultation with a gynecologic specialist. A painful swelling on bimanual examination is, in itself, not a sufficient indication. To mention but one possibility, he may be dealing with an ectopic pregnancy in which

diathermy would surely hasten the occurrence of rupture. Or other complications such as fibroids may be present where the induced hyperemia would probably lead to increased bleeding. On account of this artificial hyperemia, too, an impending menstruation would contraindicate diathermic treatment for the time being.

Further, the stage of the pelvic inflammation demands attention. In the acute and early subacute stages diathermy cannot be employed. Even in later stages initial caution is always in order, and fever or increased pain may necessitate a temporary discontinuation of the treatment.

An undue extent of an individual treatment must be avoided. Thirty minutes constitute the average duration; for after this time the vasodilator nerves may become paralyzed by the heat, and the result would be a venous stasis, rather than an arterial hyperemia.

In the enthusiasm over a new method, one is only too apt to forget other tried modes of treatment, and it behooves us to make use of all other therapeutic means which have stood the test of time. Above all, the physician must never lose sight of the fact that restitution from any inflammation requires *time*, and that no method however beneficial and ingenious, leads to that short cut to health that every patient hopes for in her own case.

With all these restrictions in mind, one may propose a simple scheme to be followed in the treatment of pelvic inflammations which may be altered or elaborated according to individual experience.

ACUTE STAGE

Rest
Fresh air
Diet and elimination

SUBACUTE STAGE

Rest
Protein therapy
Diet and elimination
Later, diathermy (cautiously!)

CHRONIC STAGE

Protein therapy
Diathermy—alternating with
Firm packing of vagina with glycerine tampons

If carried out patiently and conscientiously, the management of pelvic infections will yield, in the great majority of cases, highly satisfactory results and eliminate, to a large extent, operative procedures which seem to me wholly unphysiological and lead only too often to unnecessary mutilation.

Heat in degrees sufficient to kill bacteria, cannot be used in the human body. The only exception is in the case of gonorrheal infec-

tion, as we know that gonococci are highly susceptible to heat and, in the test tube, are killed at a temperature of 108° F. In the living, the degree of heat must be considerably higher, because the human organism is always intent on maintaining a medium and constant temperature in all organs; and as soon as the temperature rises too much in any one place, fresh cooling blood is despatched to the heated zone to prevent accumulation of heat and consequent burn. The careful work of Corbus and O'Connor¹ has demonstrated that gonococci which may lurk indefinitely in the ducts of Skene and are responsible for most cases of recurrent infection, can be killed by means of diathermy. Several foreign authors (Von Büben, van Putte) have likewise reported signal successes. My personal experience is limited to 4 cases; of these 3, which had resisted all therapeutic efforts, were promptly and permanently cured by urethral and intracervical diathermy.

Table II shows the temperatures obtained in one of the successful cases.

TABLE II. INTERNAL DIATHERMY (URETHRAL)

<i>Treatment No. I. Temperature</i>				
TIME	MILLIAMPERES	URETHRAL	VAGINAL	RECTAL
10:30	400	108.0° F.	103.2° F.	100.4° F.
10:35	600	110.0° F.	104.8° F.	100.6° F.
10:40	700	112.0° F.	105.4° F.	101.4° F.
10:45	750	112.2° F.	105.6° F.	101.8° F.
10:45 Temperature continued for ten minutes.				
<i>Treatment No. II. Temperature</i>				
TIME	MILLIAMPERES	URETHRAL	VAGINAL	RECTAL
11:12	275	104.0° F.	104.4° F.	100.0° F.
11:17	300	106.0° F.	105.2° F.	100.2° F.
11:22	400	106.0° F.	105.4° F.	100.4° F.
11:27	500	110.0° F.	106.2° F.	100.6° F.
11:32	500	112.0° F.	108.0° F.	101.2° F.
11:37	500	112.0° F.	108.8° F.	102.0° F.

So-called "surgical" diathermy employs much higher degrees of heat for the purpose of destroying tissues, particularly those of a malignant nature. In this respect it resembles the action of the cautery or of fulguration but it has much greater depth effect than either of these methods. Both cautery and the fulgurating spark char the tissues, and the eschar produced acts as a wall which protects the tissues beyond. In diathermy, on the other hand, the heat penetrates into the tissues, and reaches and destroys cancer cells disseminated in the periphery; for it must be remembered that malignant cells quickly succumb to heat. That this is not mere speculation, may be seen from the results obtained by Corbus and O'Connor,⁵ and others. The heat penetration can also be measured accurately by placing thermometers into the bladder and rectum. Thus, in a case of a very large cauliflower of the cervix, the temperature in the bladder, within one minute, rose to 102.8°, that in the rectum to 101.6°, though the electro-

coagulation took place in the center of the gigantic growth and at a considerable distance from the vesical and rectal thermometers.

Another way to determine the heat penetration in surgical diathermy is by means of thermocouples inserted into macroscopically normal tissues outside of the growth. Thus we found that nine seconds after commencing the treatment, the temperature in the tissues 5 cm. away had risen 4° F. Still more accurate is the table prepared by Dr. L. H. Jorstad, pathologist to the Barnard Free Skin and Cancer Hospital, who kindly helped me in this work.

TABLE III. THERMOCOUPLE READINGS AND TEMPERATURE DETERMINATIONS

	DISTANCE OF THERMOCOUPLE NEEDLE FROM TUMOR	DEGREE OF TEMPERATURE ATTAINED AFTER ONE MINUTE
Case I. Cancer of Vulva	1 cm.	140.0 F.
	2 cm.	132.8
	3 cm.	131.0
Case II. Cancer of Vulva	1 cm.	120.2 F.
	2 cm.	114.8
	3 cm.	111.2
Case III. Cancer of Vaginal Wall	1 cm.	131.0 F.
	2 cm.	113.0
	3 cm.	113.0
Case IV. Urethral Cancer	1 cm.	122.0 F.
	2 cm.	113.0
	3 cm.	104.0

SUMMARY

Diathermy, despite its youth, has already acquired citizenship in our therapeutic armamentarium. In this paper accurate figures have been supplied which show the exact degree of heat originated within the pelvic cavity and prove conclusively that diathermy can focus heat in the genital organs and there produce and maintain temperatures far above those obtainable with any other method:

As heat creates arterial hyperemia and hyperemia, primarily, counteracts inflammation, the principal field of diathermy in gynecology is in the treatment of pelvic inflammations. This highly beneficial method may, however, become a two-edged sword if clear-cut rules regarding indications and contraindications, dosage, duration, etc., are not scrupulously observed; and it will develop its greatest usefulness only if combined with certain other antiphlogistic means.

To one who has a clear conception of the nature of the inflammatory process, the need for operative intervention in pelvic inflammations will arise only in exceptional cases. Should, however, such an opera-

tion become inevitable, previous conservative treatment carried out systematically and over a sufficient length of time, will render the surgical procedure safer, easier and less extensive.

In chronic urethral gonorrhea diathermy may succeed where other methods have failed to kill the gonococci in the ducts of Skene.

In malignant disease of the female genitals, finally, where the affected tissues are destroyed by electrocoagulation, the deeply penetrating effect of heat may reach scattered cancer cells beyond the original growth.

REFERENCES

- (1) *Bettman and Crohn*: J. A. M. A. 88: 5321, 1927. (2) *Scheffly and Schmidt*: AM. J. OBST. & GYNEC. 18: 230, 1929. (3) *Gellhorn, George*: J. A. M. A. 90: 1005, 1928. (4) *Corbus and O'Connor*: Diathermy, 1925, Bruce Publishing Company. (5) *Corbus and O'Connor, Curtis*: J. A. M. A. 87: 1819, 1926.

METROPOLITAN BUILDING.

- v. Mikulicz-Radecki and Freund: A New Hysteroscope and Its Practical Application in Gynecology. Ztschr. f. Geburtsh. u. Gynäk. 92: 13, 1927.

The essayists give a brief outline of the history of hysteroscopy and describe a new instrument. With this instrument in many cases a study of the inside of the uterus is possible. It should be used only by competent men under strictest asepsis.

Contraindications to its use are: Infections of uterus or vagina, and intra-uterine pregnancy. Bleeding is not a contraindication.

The best time for its use is the resting period in the menstrual cycle. The hysteroscope is best fitted to clarify the changes that take place in the endometrium especially during menstruation. Diagnostically it is of value in carcinoma of the corpus, polypi, and submucous fibroids. With the aid of electrocoagulation bloodless sterilization can be performed at the junction of the corpus cavity and the tube.

LESTER E. FRANKENTHAL, JR.

- Tietze: Seven Cases of Severe Infection Due to Intrauterine Pessaries. Deutsche med. Wchnschr. 56: 1307, 1930.

Seven cases are reported with extensive uterine and adnexal inflammation, following the continued use of intrauterine pessaries for contraception. Four of the patients succumbed to the peritoneal extension of the infection and operation. One of them became infected with actinomyces.

G. E. GRUENFELD.

BREECH PRESENTATION*

BY FRED J. TAUSSIG, M.D., ST. LOUIS, MO.

THE purpose of this paper is not to attempt a review of all phases of this subject but merely to emphasize certain practical points that, through the experience of the past ten years, have led to a change in our management of these cases. At the same time I wish to report briefly on the experience in the handling of these cases during the past three or four years in the obstetric services at the St. Louis Maternity Hospital and the Jewish Hospital, with which I am connected.

The frequency of breech presentation has been given as between 3.2 per cent and 3.4 per cent. At the St. Louis Maternity Hospital there have been 155 breeches out of 4,656 deliveries, and at the Jewish Hospital the incidence of breech deliveries has been 70 out of 2,033. This would total 225 breeches out of 6,689 or 3.3 per cent. The details of these reports will be given later on in the paper.

An analysis of the etiology of breech cases is of value since it may put us on our guard to look for some of the complications that tend to produce this position. In general we can divide these causes into those that interfere with the fixation of the head in the upper portion of the pelvis and those that modify the shape of the uterus. Of the former we have: (1) contracted pelvis, (2) a thick rigid cervix, as in older primipara, (3) placenta previa, (4) multiple pregnancies, (5) hydrocephalus of the child, (6) hydramnion, (7) relaxed abdominal walls. Of the factors producing alteration of the shape of the uterine cavity we have: (1) bicornuate or arcuate uterus, (2) myoma of the uterus. In other words with a normal pelvis, a normal size and shape of the uterine cavity, and a normal single child, the force of gravity combined with the kicking movements of the child will almost always tend to a vertex presentation. In every case of persistent breech presentation a careful analysis of the factors that have produced it may disclose conditions of great value in the further management of the case. I should particularly stress the possibility of contracted pelvis and placenta previa. In some instances an x-ray of the abdomen may throw additional light.

The details of the diagnosis of breech presentation are clearly stated in our textbooks of obstetrics and do not need repetition. The diagnosis is ordinarily not difficult and mistakes are more apt to be made on account of careless, hurried examinations. Might I empha-

*Read at the joint meeting of the Central Association of Obstetricians and Gynecologists and Kansas City Southwest Clinical Society, Kansas City, October 9, 1930.

size that in our prenatal care we should not be satisfied merely with regular urine and blood pressure tests, but at each ten- to fourteen-day interval time should be allowed in the later months for a careful abdominal palpation and auscultation, together with a rectoabdominal examination of the part presenting over the pelvis. Occasionally in fat women the diagnosis is difficult; here we should have recourse to x-ray.

There are optimistic obstetricians, who maintain that a breech delivery is as easy and safe for mother and child as a vertex delivery. With all due allowance for individual skill and experience, when we deal with a large number of cases, however, the fetal mortality in breech is invariably three to four times as great as in vertex presentation. There is also an unavoidable, slightly increased morbidity and mortality for the mother under such conditions. These increased dangers are primarily due to the fact that in breech cases we cannot accurately estimate the disproportion between the child and the pelvis. In vertex cases we can see whether the head can be pushed down into the pelvic inlet, whereas in breech cases we often fail to recognize such disproportion until near the termination of labor itself. Other factors in fetal mortality are the prolonged pressure upon the cord in the second stage of labor and the necessity for a moderately rapid expulsion of the upper half of the fetal body to prevent asphyxiation.

The recognition of this incontrovertible fact has led many obstetricians in the past to recommend and practice external version during the last months of pregnancy. While this recommendation was made many decades ago it has in the past ten years been the subject of special study and practice and the reports of such men as Ehrenfest, Bartholemew, McGuiness, King, Caldwell, Studdiford and Petrone have materially added to our knowledge of the indication and technic of this procedure. Their experience leads us to the following conclusions: External version, if done without any rough manipulation, is absolutely safe for both mother and child. The fear of premature labors, twists of the cord, or loosening of the placenta have not been justified. It is a procedure that should not be done before the thirtieth nor, except in rare instances, after the thirty-eighth week of pregnancy. The percentage of failures to correct the position runs in the neighborhood of 30 per cent. In a limited number of cases it will be necessary to repeat the external version two or three times, but the incidence of a recurrence of a breech position is not as great as was believed by some men. While McGuiness and Bartholemew have used anesthesia for some of their versions, I personally would be opposed to this, since it might lead to excessive pressure on the uterine contents. In the technic of this procedure the following points should be emphasized: In all difficult cases the patient

should be given a sedative before manipulation begins and should be placed in the elevated hip posture. Then the fingers in the vagina should push the breech up out of the pelvis and with the other hand over the abdomen the breech should be pushed toward the side where the back is situated; holding it at this point the other hand catches the head and with a circular motion pushes it down toward the pelvis. Such rotation of the child in an attitude of flexion has usually been found preferable, but occasionally where this fails, a rotation in the opposite direction may be successful. After rotation has been completed in this manner some men have used pressure by means of pads to either side of the fetus to retain it in the new position. Experience has shown that this is of little value and adds greatly to the discomfort of the patient. On account of the possibility of a recurrence of a breech position it is well to check up on these cases every week or two and in doubtful cases have an x-ray photograph taken to determine the exact position.

Ehrenfest has made an interesting analysis of the outcome of 11 breeches successfully turned compared with 11 breeches which delivered unturned. In only one of the former group did the child die, whereas three of the children in the 11 breech cases died. Although this number is too small to be of great value it tends to point to the value of external version in reducing fetal mortality. While external version, therefore, may be of some help, it does not entirely solve our problem, and we will still have a considerable number of unturnable and undiagnosed breeches to deal with.

Breech presentations can be divided into complete breech, frank breech and footling. A complete breech gives the best prognosis since it uses a large diameter of breech to thoroughly dilate the cervix and yet permits of a ready grasp of one or both legs if assistance is required at the termination of labor. In the frank breech cases, delivery is rendered more difficult by the increased rigidity or splinting of the fetal body by the legs and the difficult of reaching these extremities in case of an arrest of progress. The presentation of the foot or knee, except where it occurs in relatively small twins easy of delivery, is often an unfavorable complication. In a considerable number of such cases we have prolapse of the cord and a tendency to incomplete obliteration of the cervix with its resultant dangers in the delivery of the after-coming head.

In the management of breech cases let me stress first of all the importance of complete effacement of the cervix. Nothing is more troublesome than an attempt to hurry delivery before such obliteration has occurred. In the next place I should stress what might be similarly termed "effacement" of the pelvic floor. By this I mean that, particularly in primipara, we should see to it beforehand that we eliminate any material resistance that might lead to serious tears or to an

arrest of progress by the pelvic floor. Some obstetricians have stressed the importance of "ironing out" the perineum or pelvic floor muscle. I personally feel that while a certain amount of stretching is permissible, it should not go to the extremes often recommended. Two things are important, one to avoid a tear through the sphincter or rectum and the other to avoid pelvic relaxation after delivery. I am convinced that many cases of relaxed pelvic floor are bound to occur after a complete "ironing out" under anesthesia. To me it seems far wiser and safer to stop at this stretching process halfway and then before any danger of submucous tears or fascial separations may occur, make a clean lateral cut either as an episiotomy or in difficult extractions as a perineotomy. Such cut surfaces heal kindly and if properly sutured leave a strong pelvic floor, whereas overstretched or irregularly torn surfaces rarely heal kindly.

To proceed then, having an effaced cervix and an effaced pelvic floor, even a fairly large breech will pass through and be delivered with ease. The golden rule in the management of breech cases is "push! don't pull!" The best push, of course, is that exerted by the uterine muscle and the abdominal muscles of the mother, occasionally reinforced by pressure from above made by the obstetrician or his assistant. In uncomplicated cases nothing is to be done until the breech has been expressed up to the umbilicus, then a loop of cord can be drawn down, the back gently turned toward the symphysis and pressure exerted from above to assist the flexion of the head and further expulsion. Usually the head comes down readily in good position without difficulty and the effort is merely to clean the mouth of the child, and avoid the too rapid expulsion of the fetal head. Ordinarily but a few minutes will elapse in such easy cases from the time of the delivery of the breech to the completion of the delivery of the head. In the more difficult cases nature will have to be assisted by pulling down the anterior leg so that the child enters the pelvis with its back toward the sacrum and is then drawn downward until the anterior hip is out of the vulva. The other leg can then readily be extracted and the back of the child gently turned and drawn down until the anterior shoulder lies beneath the symphysis. A finger slipped into the axilla and pressing against the scapula readily brings down this arm. The back now lies toward the symphysis and the other arm brought down by a similar procedure if it has been flexed over the head. It is at this point that special care is needed, no downward traction on the shoulder should be made, rather should an effort be made to push the body back into the pelvis so as to avoid the entrance of the head into the pelvis until after it has been put in a position of flexion. Flexion of the head can best be accomplished by a downward pressure of the finger in the mouth and upward pressure of two fingers of the other hand against the occiput. All of these

procedures must be accomplished without haste, without force, without traction, and without undue twisting of the fetal body. If the delivery of the head or its proper flexion is at all difficult, obstetricians agree almost unanimously that forceps, particularly of the type devised by Piper, should be promptly applied to the after-coming head. Those who have had experience in the use of this instrument speak highly in its favor as an agent in promoting flexion of the head and extraction without undue violence. It certainly should reduce materially the incidence of injury at or about the cervical vertebrae of the child. In frank breech presentations or where there is some difficulty in delivery from a disproportion between breech and pelvis, it seems advisable after complete dilatation of the cervix to push the breech up out of the pelvis under anesthesia and drawing down both legs, proceed with the delivery in the manner already described. There seems no doubt that owing to pressure on the cord in breech cases a prolonged second stage is very much more dangerous to the child than where the vertex presents.

In neglected cases where too long a time has elapsed to permit of the pushing back of a breech we may have to resort to traction by the finger in the groin or, in certain rare instances where the child is already dead, to the use of the hook or fillet to serve as a lever for pulling on the fetal body. These cases should, however, be reduced to a minimum under proper supervision. More and more we have come to realize that in a certain percentage of breech presentations cesarean section is the best method of delivery. This is particularly true of those where the pelvic measurements are below the normal, where the child seems unduly large and particularly in elderly primipara with the breech not engaged in the pelvis. A premature rupture of the membranes in such elderly primiparae will make us more quickly proceed with cesarean section since here we are almost certain to meet with undesirable complications and the life of the child needs special consideration in view of the age of the mother.

Several interesting analyses of breech deliveries have recently been made in this country. The fetal mortality averages somewhere between 8 and 12 per cent. Irving and Goethals out of 235 breech deliveries in ten years at the Boston Lying-In Hospital noted 23 deaths. E. L. King at New Orleans Maternity lost 16 babies out of 159 breech deliveries. DeLee of the Chicago Lying-In Hospital reported 24 fetal deaths out of 250 cases. Caldwell and Studdiford of Sloane Maternity had 36 deaths out of 256 cases. Duncan from the Royal Victoria at Montreal out of 114 breeches had a fetal mortality of only 6. With the exception of the last named, the average fetal mortality is very close to 10 per cent. Our figures were approximately the same. At the St. Louis Maternity Hospital eliminating prematures, macerated fetus, twins, etc., out of 114 breeches there were 10 deaths (8.8 per

cent), and at the Jewish Hospital out of 48 breeches there were 7 deaths (14.5 per cent). Tables I to IV will give additional data concerning these two groups of cases. In the Maternity Hospital figures I should like to call attention to the fact that the ward cases showed a fetal mortality slightly less than the private cases.

TABLE I. JEWISH HOSPITAL CASES

DELIVERIES	BREECH PRESENTATION	MACERATED OR PREMATURE	TWINS	REMAINING
2033	70	9	13	48

TABLE II. ANALYSIS OF 48 REMAINING BREECH DELIVERIES

	NUMBER	FETAL DEATHS	PERCENTAGE MORTALITY
Primipara	22	5	22.0
Multipara	26	2	7.6
Total	48	7	14.5

Jewish Hospital.—Analysis of 7 fetal deaths.

1. Para i, spontaneous easy delivery, died one hour after birth of intracranial hemorrhage.

2. Para iv, footling presentation, cervix not completely dilated, prolonged labor, arms over head, difficult extraction.

3. Para i, frank breech, pelvis simple flat, rupture of membranes at onset of pains, labor fifty-two hours, difficult extraction by pushing up breech and grasping legs.

4. Para iii, footling, preeclamptic mother, external version failed at eighth month, prolapsed cord during labor.

5. Para i, footling, difficult delivery of head, possibly uneffaced cervix, born living but died on fourth day of intracranial bleeding.

6. Para i, funnel pelvis, child weighed 2820 gm., extraction difficult, stillborn.

7. Para i, unsuccessful attempts at external version at eighth month, pelvis normal but breech high, dry labor, forty-five hours, second stage over six hours, arms over head, difficult extraction.

TABLE III. ST. LOUIS MATERNITY HOSPITAL

	TOTAL NUMBER	TWINS	PREMATURE	MACERATED	MONSTROSITY	CEASAREAN SECTION	REMAINDER	FETAL DEATHS OF REMAINDER	PERCENTAGE FETAL DEATH
Private Cases	83	5	8	6	1	2	62	6	9.6
Ward Cases	72	12	6	1	1	0	52	4	7.7
Total	155	17	14	7	2	2	114	10	8.8

St. Louis Maternity Hospital.—Analysis of 10 Fetal Deaths.

1. Thirty-three-year-old para iv. Pelvis normal. Rather free hemorrhage with onset of pains. Very rapid labor. Delivered twenty minutes after entering hospital. Child weighing 2600 gm. expelled stillborn, followed at once by placenta. Diagnosed as premature detachment of normal situated placenta.

2. Thirty-five-year-old para i. Normal pelvis, dry labor, frank breech. Child weighing 2775 gm., delivered easily, child died of intracranial injury ten hours after birth. Abdominal walls lax and pendulous, possibly a case favorable for external version in the ninth month.

3. Twenty-five-year-old para iv. Postmature, induced with castor oil and quinine, hydramnion, easy spontaneous delivery. Child weighing 3720 gm. born, showed evidence of subcutaneous hemorrhages over body. Died after twenty-five hours with diagnosis of blood dyscrasia.

4. Thirty-five-year-old para iv. Had one previous normal breech delivery. Original measurement indicated normal pelvis, although measurement taken after delivery showed a simple flat pelvis. After a first stage of twenty-two hours with full dilatation of cervix, breech was pushed back, legs brought down and child extracted with considerable difficulty because of deflected head. Child weighed 2960 gm., could not be resuscitated, showing intracranial hemorrhage at autopsy.

5. Twenty-eight-year-old para i. Pelvis normal, breech high, pains began twenty-eight hours after rupture of membranes, dry, long labor lasting thirty-nine hours. Second stage delayed, 5 hypodermics of 3 drops of pituitrin. Extraction with forceps to after-coming head. Child could not be resuscitated, weighed 3720 gm.

6. Thirty-four-year-old para iv. Normal pelvis at term, membranes ruptured at onset of pains. Cord prolapsed at 4-finger dilatation of cervix. Delivery necessarily rapid. Child stillborn.

7. Twenty-two-year-old para i. Funnel pelvis, tubers 7.5 cm., rapid first stage (nine and one-half hours) but slow second stage (five and one-half hours). Presenting part at vulva for four hours before delivery was begun. Delivery easy with forceps to after-coming head. Fetus cyanotic, could not be resuscitated, although heart beat for one hour.

8. Forty-two-year-old para iv. Pelvis slightly contracted, diagonal conjugate 12½ cm., frank breech, rapid first stage. Attempt to assist delivery by pushing breech up and bringing down legs unsuccessful in out-patient service. Sent into hospital after six and one-half hours second stage. On admission fetal heart beat slow and weak. Child weighing 4260 gm. delivered easily, stillborn.

9. Thirty-year-old para i. Normal pelvis, footling presentation. Rapid first stage, prolonged second stage, child, postmature, weighing 4950 gm., stillborn. Extraction not difficult.

10. Thirty-one-year-old para iii. Frank breech, simple flat pelvis, first stage thirteen hours. After half-hour second stage, attempt to push up breech and bring down legs failed, apparently on account of a contraction ring. At this time fetal heart good. Given morphine hyoscine to relax ring. Fetal heartbeat ceased two hours later. Delivery after four and one-half hours second stage. For demonstration purposes breech pushed up and legs brought down easily and delivery readily completed. Child stillborn, weight not recorded.

TABLE IV. ANALYSIS OF BREECH CASES

	NO.	FETAL DEATHS	PER CENT
Primipara	61	5	8.0
Multipara	53	5	9.6
Total	114	10	8.8

Presentation of Breech: S.L.A., 63; S.L.P., 9; S.D.A., 43; S.D.P., 14; Footling, 13.

COMMENTS

My own comments on the 10 fetal deaths in the Maternity series and the 7 fetal deaths in the Jewish Hospital series are that while some of the deaths were unavoidable (prolapsed cord, prematurely de-

tached placenta, blood dyscrasia), others cannot be entirely excused. These deaths were due as much to faults of omission as of commission. While at times there may have been injury due to too rapid or forceful extraction, there is a definite group where the second stage was unduly prolonged. Prolonged pressure on the cord was here doubtless an important factor in fetal death. Pushing up the breech, drawing down the legs and proceeding with gentle extraction before the child was weakened would probably have given better results. On the other hand I believe that a few hours' test should always be given, particularly when a mature child in breech presentation has previously been spontaneously delivered. Even after such a two-hour test the breech can still be safely pushed back and delivery effected without danger of uterine rupture. In cases of funnel pelvis and in simple flat pelvis, we must more frequently than in the past have recourse to cesarean section, especially if the child is at term and apparently over 3500 gm. in weight.

To summarize then let me emphasize: (1) Careful analysis of all factors that might be causing the breech presentation (especially contracted pelvis, placenta previa). (2) Careful prenatal examinations to insure an early diagnosis and, if possible, a correction of the position by an external version between the thirtieth and thirty-eighth week of fetal life. (3) Reiteration of the doctrine of noninterference in breech cases, "just push! don't pull!" (4) Avoidance of all extraction procedures, whenever possible, until the cervix has been completely effaced. (5) Moderate stretching, followed if necessary by a deep lateral perineotomy, whenever the pelvic floor promises to offer resistance. (6) Avoidance of traction on the shoulders or torsion of the body in delivery to prevent injury to the base of the neck. (7) Application of forceps to the after-coming head whenever simple flexion of the head and pressure from above is not followed by its expulsion. (8) In prolongation of the second stage beyond a fair test, approximately two hours, pushing up the breech, bringing down both legs and proceeding with extraction. (9) Cesarean section in elderly primipara with rigid cervix and whenever pelvic measurements or the progress of labor indicate a disproportion between pelvis and child. Finally, I want to stress that breech delivery requires expert handling when extraction becomes necessary; that in private practice advice should be sought promptly when the second stage is at all prolonged; and that, in maternity hospitals or divisions, ward cases should not be left to the undirected care of the young intern but should be done or directed by men who have had considerable obstetric experience.

PLACENTA ACCRETA

CLINICAL CONSIDERATION, PATHOLOGY AND MANAGEMENT

BY DAVID FEINER, M.D., NEW YORK

(Attending Gynecologist to the Beth Moses and Israel Zion Hospitals)

I HAVE been prompted to elaborate briefly upon the condition herein described, because of the rarity of this placental anomaly and the high death toll consequent to the failure to recognize the same. Placenta accreta is a definite pathologic entity, with an anatomic and clinical picture peculiar to itself, and not to be confused with the more common complication of adherent placenta; the latter is the result of insertion in the tubal corners or lateral margins of the corpus, or where implantation has taken place on a uterine septum, or more rarely, where there is a large thin placenta of the membranacea type. To be designated as an accreta, the distinguishing factor is the insufficient development or the entire absence of the decidua basalis, thus exposing the muscle of the uterine wall to the erosive action of the trophoblast, and penetration of the villi. This brings about a disastrous fusion of the placenta and the muscle wall, which renders impossible a normal or manual separation of the placenta, because of the absence of a line of cleavage.

A review of the mechanism of placental separation will help to clarify a proper conception of this departure from the normal. Immediately following the delivery of the fetus, the entire uterus with the exception of the placental site, retracts and thickens. The placental separation is then effected within the decidua spongiosa, as originally demonstrated by Langhans. Here, the trabeculae are extremely delicate, and contain the markedly dilated vessels. The hyperemia, ex vacuo, following the expulsion of the fetus, produces a greatly increased influx of blood into this layer. This results in rupture of the above-mentioned spongiosa sinuses and vessels, which are further torn by the folding and puckering of the placenta. The retroplacental hematoma thus formed creates a line of cleavage, and the placenta separates off in the spongy layer of the serotina. In a placenta accreta, however, the histologic study reveals the absence of the serotina with its spongy layer; because of this defect, the villi penetrate the muscular wall of the uterus, and hence the placenta and walls make up one continuous structure and present no line of cleavage. In addition, the involved area of the musculature undergoes destruction as a result of its contact with the invading trophoblastic elements; this, in turn, leads to an excessive thinning of the uterine wall, or in extreme cases, to a rupture of the latter.

Various estimates have been made of the frequency of this complication. Polak places the incidence of accreta at approximately 1 in 6000; B. C. Hirst, 1 in 40,000. Polak reports 4 cases met during an extensive practice covering thirty years. Of these, the first three were treated conservatively, by attempted manual removal, and terminated fatally as result of sepsis. The fourth case, a primipara, seven months gravid, with a complicating large submucous fibroid, recovered following a supracervical hysterectomy. Frankl, in a discussion of this paper, could recall but 6 cases of true placenta accreta, of the immense material encountered in his clinic; and agreed with Polak that the indication is definite for extirpation of the uterus. Out of 36 cases collected by Kraul, only 8 women recovered. A survey of the literature by me has revealed a total of 40 cases reported, in only 20 of which the placenta was examined in situ. Kraul describes 3 cases occurring in a total of 60,000 deliveries during the last twenty-three years at his clinic. Of these, the first 2 were fatal, the third survived a vaginal hysterectomy. Nathanson, in an excellent contribution to this subject, reports 4 cases occurring in a collective series of 75,000 deliveries, placing the incidence at approximately 1 in 20,000. Dietrich quotes the following authors, who, in reporting similar cases, stressed the excessively thinned out condition of the uterine wall: Kworostansky-Meyer Rüegg (fundus, 1 mm. thin); Schwenderer (2 mm.); Bauereisen (3 mm.); E. Martin could palpate the intestines through the thinned out uterine wall; Wegelin (1-3 mm. thin); R. Meyer (in places, $\frac{1}{2}$ -1 mm.); Schmidt (in his first case, 4 mm., in his second, $\frac{1}{4}$ mm.); Schweitzer (1 mm.); in Alexandroff's case, the rupture occurred in the tenth month, and was diagnosed and operated upon the two weeks later. Schwenderer describes a case in which Credé's maneuver led to a rupture of the uterine wall thinned out by placenta accreta.

In the case of a para v, reported by Tennant, it was demonstrated that the placental attachment may not alone penetrate the peritoneal coat of the uterus, but may actually invade the visceral cavity. Schweitzer's case of placenta accreta was at the same time, a placenta previa cervicalis. Jaschke also speaks of the "burrowing" in of the fetal elements into the cervical musculature in low placental insertions. Dietrich reports in detail, the case of a forty-year-old para iv, with a very significant previous history in her four deliveries, including 2 manual removals of the placenta, one febrile puerperium, 2 severe postpartum hemorrhages, and 2 postpartum curettages. In the present delivery, the patient was admitted with mild labor pains, suddenly collapsed, and following version and extraction, died. The autopsy showed a placenta accreta of the membranacea type, with a spontaneous perforation of the uterus, and partial extrusion of the placenta. He calls attention to the fact that a seven-year amenorrhea has existed between the preceding delivery and the case now reported, which he attributes to an atrophy of the mucosa due to an over zealous curettage. This factor has likewise been stressed by other authors (Fritsch, Küstner, Veit, Wertheim), though the ability of the uterine mucosa to *restitutio ad integrum*, is often remarkable. Dietrich also describes a case of placenta accreta, reported by Baumgart-Benecke, due to an atrophied mucosa, following an amenorrhea of four years' duration (due to atmocausis); because of infection, and scar changes, a Porro-hysterectomy was performed. Similar cases were reported by Holzapfel and Frankenstein, following vaporization therapy.

The etiology is summed up by Polak as dependent upon changes which produce an atrophy or absence of the normal uterine decidua, such as previous manual removal of the placenta, vigorous curettage, endometritis, submucous fibroid, etc. Polak's case occurred in a primipara; of all other cases reported, according to Kraul, only 3, including his own, were para i, the remainder, multipara. The case re-

ported by me is the first of its kind occurring at the Israel Zion Hospital during the past nine years, in a total of 10,000 labors. Another phase of this case worthy of comment is the absence in the previous history of any of the aforementioned etiologic factors.

CASE REPORT

Mrs. P. N., aged twenty-five, one full-term delivery, five years previous, with spontaneous expulsion of the placenta, and no postpartum complications; no history of previous miscarriage or pelvic inflammation. With present pregnancy, estimated date of delivery, March 20. Admitted to Israel Zion Hospital, March 22. First stage, four hours, delivered spontaneously a somewhat masecerated fetus (heart sounds heard four days previously). After waiting one hour for the placenta to

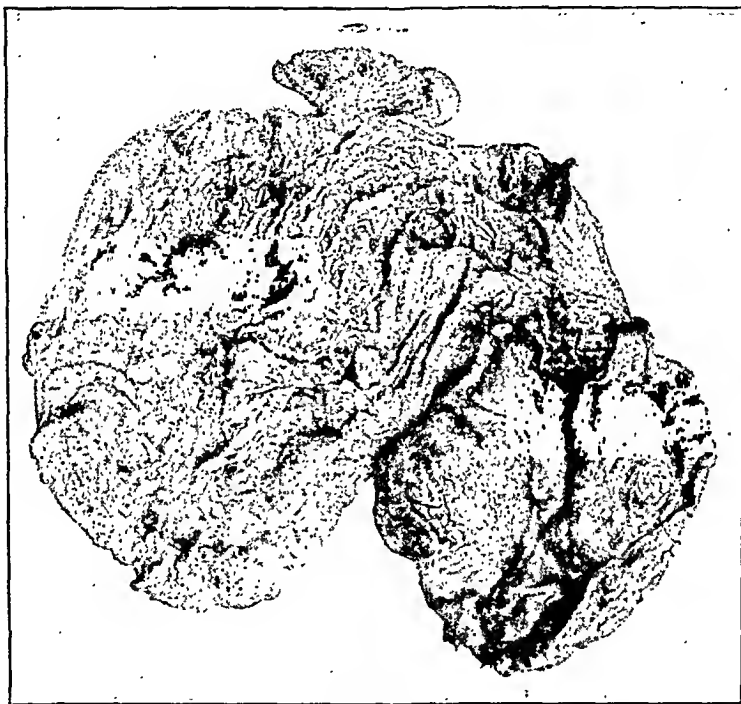


Fig. 1.—Showing gross specimen, with placenta in situ.

separate, the attending physician ventured a Cr  d   expression of the same without result. Following the forcible manipulation, however, the patient began to bleed profusely, and an attempt was made to remove the placenta manually. This was unsuccessful, owing to the fact that the doctor was unable to find any line of cleavage, and recognized the handful of tissue removed as consisting largely of uterine muscle wall. The uterus was packed promptly to control the profuse bleeding. When I saw the patient one-half hour later, she had received 1000 c.c. of glucose intravenously, followed by 750 c.c. of blood to combat the extreme shock. Her condition at this time was somewhat improved as the result of this stimulating therapy, but the pulse was still rapid and thready. Two hours later, she was again put under light ether anesthesia, the packing removed, and under strict asepsis, the interior of the uterus gently but thoroughly explored. The placenta was found spread out over the entire posterior wall of the uterus, but no line of cleavage could be found. A ragged gap was palpable in the left lateral margin, indicating

the site from which the mass of muscle tissue had been dug out. The uterus was again repacked to control the continuous oozing. The diagnosis was obviously placenta accreta, and hysterectomy deemed imperative. Dr. Ralph Beach, in consultation, concurred in this opinion, and advised deferring the operative procedure a few hours until the general condition of the patient improved. Six hours later, a supracervical hysterectomy was performed. The patient made an uneventful recovery, and was discharged from the hospital two weeks later.

PATHOLOGIC REPORT BY M. GOLDZIEHER, PATHOLOGIST TO THE ISRAEL ZION HOSPITAL

Gross.—The uterus was large, yet flabby and collapsed. Its musculature was soft, its surface was covered with smooth, shiny peritoneum. On opening the uterine cavity, its inner surface appeared to be clad with a thin, transparent membrane, which peeled off fairly well from the uterine wall, yet in places it was adherent much more strongly, and these places projected more or less, far into the lumen of the uterine cavity. At one particular place there was an area bulging into



Fig. 2.—Microscopic section, showing the direct contact of the placenta with the myometrium, with the chorionic villi penetrating between the muscle bundles of the myometrium.

the lumen, characterized by deep, bluish-purple color. This bulging nodule was about the size of a goose egg. Other smaller projections resembled the convolutions of the cerebral cortex, but they were all much smaller.

In peeling off the membrane from the cervical portion of the uterus, there was very little tissue of a yellowish-gray color, which connected this membrane with the musculature. Occasionally, however, a few large varicose blood vessels were found, some of which were plugged by dark red clots. Reaching an area midway between the cervix and the fundus there was more and more tissue between the membrane and the uterus proper. This tissue was of a spongy, villous structure and was readily identified as placental tissue. Many varicose vessels were found therein. The bulk of the placental tissue was located in the fundus, and while the peripheral portion of the placenta could be enucleated without much difficulty, higher up the separation became impossible and either placental tissue was left behind or the muscle tissue was torn into.

The musculature of the fundus was considerably thinned out and placental tissue could be seen entering between bundles of musculature as far as approaching the serosa by 2 or 3 mm.

Microscopic.—The placental tissue showed extensive necrobiotic changes, such as breaking up of nuclei or poor staining of the cells with homogeneization of the intracellular substance. Occasionally there was extensive hyalinization, the hyaline taking on various shades of color from pink to yellowish-pink and finally to an almost orange-yellow. These changes were more conspicuous the closer we came to the uterine musculature. In the more distant areas, however, there was a good deal of fibrosis, particularly about the larger blood vessels. Calcification was quite extensive and it seemed that these deposits were also more massive in the vicinity of the myometrium.

There was no sharp demarcation of placental tissue and myometrium. Nitabuch's fibrin stripe could be made out. Projections of placental tissue were penetrating between the muscle bundles of the myometrium, while isolated bundles of uterine muscle tissue could be found surrounded by placental tissue or by yellowish homogeneous masses, such as described above.

The myometrium showed diffuse edema and considerable distention, both of its blood vessels and lymphatics. The top layer of the myometrium showed occasional fibrosis; this newly formed edematous connective tissue coalescing with the homogeneized areas of the placenta.

CONCLUSIONS

1. Placenta accreta is a rare but well-defined clinical and pathologic entity, not to be confused with placenta adherans; the former follows some predisposing condition which leads to an atrophy of the endometrium; the latter, caused by some disturbance in the separating mechanism of the muscle.

2. The presence of placenta accreta is suggested by a failure at separation of the placenta and by an absence of bleeding; this may be confirmed by aseptic exploration of the uterus under anesthesia.

3. Manual removal is impossible and can only result in hemorrhage, sepsis, or perforation. (Polak.)

4. Early abdominal hysterectomy is the only rational procedure as soon as the diagnosis has been established definitely by the failure to demonstrate a line of cleavage.

REFERENCES

- (1) *Alexandroff*: Monatschr. f. Geburtsh. u. Gynäk. 12. (2) *Andrews, C. J.*: J. A. M. A. 82: 1780, 1924. (3) *Baumgart and Benecke*: Ztschr. f. Geburtsh. und Gynäk. 38. (4) *Bauereisen*: Ztschr. f. Geburtsh. u. Gynäk. 53. (5) *Cooper, St. Cloud*: J. Arkansas M. Soc. 21: 95, 1924. (6) *Dietrich, H. A.*: Ztschr. f. Geburtsh. u. Gynäk. 84: 579, 1922. (7) *Foster, D. C.*: Canad. M. A. J. 17: No. 2, 1927. (8) *Frankl, Oskar*: Surg. Gynec. Obst. 32: No. 5, 1921. (9) *Frankl, Oskar*: Trans. Am. Gynec. Soc. 48: 12, 1923. (10) *Fritsch*: Zentralbl. f. Gynäk., Nr. 52, 1894. (11) *Frankenstein*: Monatschr. f. Geburtsh. u. Gynäk. 28: p. 401. (12) *Hinselman, Hans*: Sonderabdruck aus Biologie und Pathologie des Weibes, 1924. (13) *Holzappel*: Verhandl. d. Deutsche Gesellsch. f. Gynäk. p. 478, 1909. (14) *v. Jaschke*: Ztschr. f. Geburtsh. u. Gynäk., p. 556, 1910. (15) *Kraul*: Ztschr. f. Gynäk. 52: 828, 1928. (16) *Kworostansky*: Arch. f. Geburtsh. u. Gynäk. 62u: 70. (17) *Kustner*: Zentralbl. f. Gynäk., Nr. 30, 1895. (18) *Martin, E.*: Monatschr. f. Geburtsh. u. Gynäk. 23. (19) *Meyer, R.*: Berl. klin. Wehnsehr., Nr. 25, 1909, and Ztschr. f. Geburtsh. u. Gynäk. 70: p. 333. (20) *Polak, J. O., and Phelan, G. W.*: Surg. Gynec. Obst. 38: 181, 1924. (21) *Schwendener*: Monatschr. f. Geburtsh. u. Gynäk. 18. (22) *Schmidt, M. B.*: Zieglers Beitr. z. pathol. Anat. 63: 82, 1909. (23) *Schweitzer*: Arch. f. Geburtsh. u.

Gynäk. 109. (24) *Strachan, Gilbert I.*: J. Obst. & Gynec. Brit. Emp. 30: No. 4. (25) *Tennant, C. E., Wilson, R. E., and Craig-Sullivan, Helen*: Colo. Med. 22: 145, 1925. (26) *Wegelein*: Verhandl. d. Deutsche path. Gesellsch., p. 295, 1909. (27) *Weit*: Zentralbl. f. Gynäk., Nr. 22, 1897. (28) *Wertheim*: Zentralbl. f. Gynäk., Nr. 40, 1895.

875 ST. MARKS AVENUE.

RIGOR MORTIS OF FETUS CAUSING OBSTRUCTION IN DELIVERY, WITH THE REPORT OF A CASE*

BY MORRIS LEFF, M.D., NEW YORK CITY, N. Y.

DEE states that "this condition is probably common, although it is rarely observed and still more rarely published." Only two other textbooks on obstetrics make any mention of the same.

Mrs. B. G., aged thirty-two, para iii, has one child eight years old. Three years ago she was delivered of a stillborn fetus, which was due to the delay in the delivery of the after-coming head, in a breech presentation.

In her present pregnancy she came under my observation during the antepartum period. Her blood pressure and urine were normal. Her pelvic measurements were: intercrural 30 cm., interspinous 26 cm., external conjugate 20 cm. The outlet was roomy. She was calculated to give birth April 2, 1930. On April 9, 1930, at 5 A.M. she was admitted to the hospital in active labor. Vaginal examination disclosed that the cervix was fully dilated; the membranes had ruptured a short time previously. The head was in midpelvis and presenting in the R.O.P. position. The patient continued to have strong pains, which recurred every two to three minutes, but she did not seem to make progress, and the head persisted in the posterior position. The fetal heart sounds which were regular at first, began to slow down alarmingly with each pain.

At 6 A.M. she was anesthetized and a forceps delivery attempted. As the forceps were applied and slight traction was made, there was a gush of blood from the uterus, which apparently was due to a separation of the placenta. Under the circumstances it was considered advisable to remove the forceps, and to deliver by version instead.

The version was accomplished without great difficulty, but only one leg was brought down, with the foot outside of the vagina. On making traction on this foot great resistance began to be encountered. The uterus was well relaxed, and there did not seem to be present any obstruction which should hinder the delivery. An effort was made to bring down the other leg, but the leg could not be flexed nor the thigh extended so that this attempt had to be abandoned. Traction on the first leg was therefore continued, augmented by pressure on the uterus from above with but little progress. The fetal heart sounds could not be heard at this time. After a great deal of difficulty the groin came in sight, and the soft tissues were found to be ripped open. As no more force could be exerted on that side, the finger was inserted into the other groin in order to make traction on it. With the first pull these tissues also tore through. With further pressure from above the trunk was grasped and was extracted with much effort. The arms and head, however, were delivered with comparative ease.

*Presented before the Section of Obstetrics and Gynecology of the New York Academy of Medicine, November 25, 1930.

At the time of the delivery I had not realized what was causing the trouble. The assumption was that some congenital malformation was causing the obstruction, but there was none to account for it.

When the fetus was examined the cause became evident. The fetus was as stiff as a board. It had gone into rigor mortis, apparently a few minutes after it died when the placenta separated. While the version was being done it was still flaccid, but by the time the leg was brought down the rigor had set in, and further manipulation became impossible. In this rigid condition it could not conform to the curves of the pelvis and therefore could only be extracted with great difficulty.

It was fortunate that the rigor set in after the version was completed, as it would have been exceedingly dangerous and likely impossible to perform the version with the fetus in that state. Every limb became like a metal instrument, liable to cut into the uterine wall, had the bringing down of the second leg been persisted in.

The tissues in the groin did not really tear, but rather broke from the rigidity. I afterward sutured them with number two catgut, but on extending the thigh, the sutures tore through the tissues.

An inspection was made of the cervix and vagina; fortunately there was no damage done, and the patient made an uneventful recovery.

REFERENCES

Berkeley, C., and Bonney, V.: Difficulties and Emergencies of Obstetrical Practice, ed. 3, 1921, p. 743. *Davis, E. P.*: Treatise on Obstetrics, ed. 2, 1904, p. 115. *DeLee, J. B.*: Principles and Practice of Obstetrics, ed. 5, 1928, pp. 581, 684. *Grigg, W. C.*: Brit. M. J. 2: 493, 586, 707, 772, 1874. *Liegner, B.*: Ztschr. f. Geburtsh. u. Gynäk. 83: 400, 1920. *Müller*: Kor.-Bl. d. allg. ärztl. Ver. u. Thüringen 34: 334, 1905. *Parkinson, C. H. W.*: Brit. M. J. 1: 304, 1908.

15 EAST ONE HUNDRED AND ELEVENTH STREET.

Barbanti-Silva: A Pedunculated Fibroma of the Labium Majus Developed from the Extra-inguinal Portion of the Round Ligament. Arch. di ostet. e ginec. 17: 294, 1930.

The author, after a few general remarks on extrapelvic newgrowths of the round ligament, illustrates clinically and histologically a case of pure fibroma of its extrainguinal portion.

Regarding the genesis of these rare tumors, accepting the hypothesis of Laviano, the author believes that either the tumor implanted itself on cicatricial tissue, or that from the beginning it was a fibromyoma and later the muscular fibers were broken and hypertrophied by the connective tissue element.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF JANUARY 13, 1931

DR. RADFORD BROWN (by invitation) reported a case of **Tuberculosis of the Corpus Uteri Without Involvement of the Endometrium.** (For original article see page 255.)

DISCUSSION

DR. M. A. GOLDBERGER.—I believe that if a good part of the endometrium is sectioned somewhere a tubercular lesion will be found and that the extension most likely is, first, in the endometrium and then in the myometrium.

DR. G. L. MOENCH.—At the University of Tuebingen 10 per cent of all adnexal disease was due to tuberculosis. I believe with Dr. Goldberger, that probably the endometrium was involved somewhere.

The mode of extension of the tuberculous process is at times interesting. We found, for instance, that if the tubes were involved we would get, sooner or later, a tuberculous peritonitis. On the other hand, if the peritoneum was involved before the genital organs, we would not have an inflammation of the tubes or uterus. That would seem to contradict the usually assumed descending mode of infection, except that Baumgarten, working on the subject, showed that when there is tuberculosis of the peritoneum the fimbriae of the tube became glued together so early in the disease that the tube did not become affected, whereas if the tube was involved there was a reversal of the lymph stream with descending infection of the peritoneum. This knowledge may perhaps at times help us in our therapy.

DR. RADFORD BROWN.—In answer to Drs. Goldberger and Moench, I would say that possibly if every portion of the endometrium had been sectioned we may have found a tuberculous process there, but the endometrium was fairly well gone over and blocks were taken from various portions, near the internal os, the mid-portion of the body on all sides, from the fundus, and on rather close examination of these there was no evidence found of tuberculosis.

In answer to the question of Dr. Vineberg, I would say that there are reports of primary tuberculosis of the cervix and some of them have been due to tuberculosis in the male where there was a tuberculous orchitis or tuberculosis of the penis.

DR. E. H. DENNEN (by invitation) made a **Presentation of a New Forceps.** (For original article see page 258.)

DISCUSSION

DR. JOHN O. POLAK.—This particular type of forceps has been used at the Methodist Maternity in Brooklyn and is stated to possess all of the advantages of axis traction.

I have always felt that one should become familiar with the application of a particular pair of forceps, the greater his experience the more he can do with the

particular instrument, yet it is impossible that one pair of forceps is applicable to a head in every position and at every level in the pelvis.

Personally I regard the Kielland as a rather dangerous forceps; in my opinion it has only one use, to bring the head into the pelvis when it is arrested in the transverse diameter of the brim—not on a floating head. We teach that the safest time to do forceps is when the head has reached the spines and we feel that patience and pain will do much to bring the head to the spines.

The Barton forceps has a great advantage in parietal presentations and in deep transverse arrests; those who have used them realize how easily the head may be drawn down in these transverse arrests.

The type of forceps which Doctor Dennen has demonstrated is a most perfect mechanical development and in median and low operations has the advantage of giving axis traction.

DR. W. E. CALDWELL.—Dr. Dennen is right in insisting on the axis traction principle in forceps. Too often traction on the handles of the forceps pulls the head laterally, increasing the diameter and pulling against the anterior wall of the birth canal. I believe that the forceps which Dr. Dennen has demonstrated have been designed according to the right principles and are a definite advance since they will do away with traction rods or the necessity of constantly studying the position of the child's head during the delivery.

The Barton forceps has a limited use. Unfortunately the makers have not as yet been able to standardize their manufacture and very few of the models made correspond to the original pair. One pair which I recently saw had a variation of 5 cm. from the original pair, but I think some of the bad results reported with the Barton forceps and the difficulty that some have had in their use may be due to a badly made forceps.

OBSTETRICAL SOCIETY OF PHILADELPHIA

MEETING OF JANUARY 9, 1931

DR. JACOB HOFFMAN read a paper entitled **The Effect of Anterior Hypophyseal Implants Upon Senile Ovaries of Mice.** (For original article see page 231.)

DISCUSSION

DR. VIRGIL MOON (by invitation).—This remarkable series of experiments opens up some very interesting biologic problems, conceptions and possibilities. We must understand, however, in attempting to evaluate them that there are certain principles which have not been violated in the experiment, but which we might violate in our conception of the experiment if we are not guarded against this.

We were told that these implants were not successful in the sense of becoming living integral parts of the mouse. They did not become living tissue in the sense that a skin graft does. If that is true, and of course we know it to be true, then whatever effect was produced must have been produced by the substance residing in the anterior portion of the pituitary gland implanted in the mouse. This would suggest that the portion of the pituitary gland implanted became a sort of reservoir which was absorbed gradually into the body and into the physiologic activity of the mouse.

A senile mouse weighs perhaps 18 to 20 gm., the implant weighed perhaps 0.25 gm., a ratio of 80 to 1. A human subject weighing 160 pounds must receive an implantation of approximately two pounds in order to receive an amount of

gland substance proportionate to that used in the experiment. With so large an implant of pituitary gland substance we should expect considerable physiologic excitation!

Such factors will have to be taken into consideration and evaluated when attempting to determine the significance of such experiments. This is not at all intended to minimize the significance of these trials, but simply to offer a warning against too wide an interpretation.

DR. HOFFMAN (concluding).—I think Dr. Moon is probably right, but it will require further study to prove definitely whether or not the activity of these implants, some time after implantation, or whether the primary effect, is the essential one. I believe that they, so to speak, simply set certain latent forces into motion.

DR. B. M. ANSPACH AND DR. J. HOFFMAN presented a paper entitled **Perforating Chorionepithelioma of the Uterus.** (For original article see page 239.)

DISCUSSION

DR. THADDEUS L. MONTGOMERY.—The whole question of chorionepithelioma formation presents an ever-interesting problem, the solution of which is being approached more closely every day. I cannot but feel that we are very near to the discovery of the cause of this malignant growth.

We are learning constantly more and more concerning the hormones which have to do with the nidation and growth of the fertilized ovum. It will not be long before we will be able to so control the operation of these hormones that such conditions as necrosis of the chorionic epithelium or overgrowth of the chorionic epithelium may be produced experimentally.

It would appear that in normal early pregnancy, two factors, one local and one general, are at work to prevent overinvasiveness of the chorionic ectoderm. The local factor lies apparently in the decidual reaction of the endometrium, for wherever the chorionic epithelium meets the resistance of the decidua, a melting down of tissue, the "fibrin layer of Nitabuck" develops. The general resistance results from the reaction of the general maternal organism to bits of syncytial tissue which dislodge from the chorionic layer and pass into the maternal blood stream.

In the normal placenta, such processes are finely balanced, and we find only scattered foci of necrosis of the chorion in epithelium and villi. Departures from this normal balance are found in such conditions as extensive necrosis of the placenta in which the local and general maternal resistance is preponderant and in chorionepithelioma in which the maternal resistance is lowered. In the case of placenta accreta it is evident that the local resistance of the decidual layer is absent but the general maternal resistance to the invasion of other organs is still present.

The cases described by Dr. Anspach present a peculiar phase of chorionepitheliomatous growth, and his report adds to the accumulating knowledge of this singular disease.

DR. ANSPACH (concluding).—The problems that Dr. Montgomery mentioned are of course most interesting. Evidently in the blood or the tissues of every woman who conceives and in whom placenta grows, there is produced a substance that stops the growth of the chorion cells at a certain time and when this normal inhibition is disturbed the proliferation may become abnormal and destructive.

In our case we thought at first because of the hemiplegic symptoms that the patient had a metastasis to the brain. With the most careful study we were un-

able to determine positively whether such a condition really existed. The right-sided symptoms gradually abated but when I last heard of her they had not entirely disappeared.

DR. B. M. ANSPACH AND DR. J. HOFFMAN presented a report of two cases of **Primary Carcinoma of the Fallopian Tube**. (To be published later.)

DR. L. C. SCHEFFEY AND DR. W. J. THUDIUM presented a paper entitled **End-Results in the Treatment of Carcinoma of the Cervix With Radium**. (For original article see page 247.)

DISCUSSION

DR. FLOYD E. KEENE.—The technic which Dr. Scheffey and his associates have used is practically the same as that which we have employed at the University Hospital. Our average dosage has been 2400 mg. hours of radium element applied in the form of capsule and needles. For a long time we have held the view that the primary dose was the one which accomplished the result, but, as Dr. George Gray Ward has demonstrated so clearly, a careful follow-up of these cases is essential and reirradiation employed on the appearance of any lesion suggesting a recurrence.

Dr. Kimbrough is now engaged in checking up our results, but the work has not progressed sufficiently to permit of any conclusions.

In an analysis presented by Drs. Norris and Kimbrough of 262 patients who had been under observation for five years or more, the following results were obtained: There was a total salvage of 12.7 per cent. In the Stage I cases where radium alone had been used, 37 per cent of the patients were alive and apparently well. In the same type of case when a cauterization and irradiation had been employed, the five-year salvage was 42.9 per cent. In my opinion a high cauterization combined with irradiation should be employed in the early cervical lesions.

DR. BAXTER L. CRAWFORD (by invitation).—Gynecologists have made much progress in handling cases of carcinoma of the cervix and fundus, and it is because of studies of this kind that they have definite data as to the results of various forms of treatment. The proper evaluation of the methods of treatment of malignant disease is being made by other specialists, but very few of the other departments have made as much progress along this line as gynecologists. Another point to be emphasized is that of an efficient follow-up system in handling these cases. This is largely a personal matter because it requires much perseverance and system to show as high a percentage of follow-up as demonstrated in this paper.

DR. THUDIUM (closing).—Dr. Keene has brought up the question of high cauterization prior to irradiation. A goodly number were cauterized before applying the radium, especially when a large carcinomatous mass protruded into the vaginal canal.

It is quite evident that improvement in curability statistics is dependent upon early diagnosis. To accomplish the latter persistent efforts in the education of the laity regarding significant symptoms must be continued. Furthermore, we must constantly impress the medical student and the practitioner with the importance of early biopsy in suspicious cervical lesions, in addition to proper prophylactic treatment of the damaged cervix.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

REVIEW OF NEW BOOKS

Almost simultaneously two short gynecologies^{1, 2} have appeared, the one less than 400, the other some 325 pages. This must be a distinct relief to the medical student who hitherto has been burdened by the huge textbooks covering every phase of the field through which it was necessary to wade in order to obtain even a superficial knowledge of the subject. In these columns I have repeatedly urged medical authors to make an effort to compress students' textbooks into sizable volumes in order to make it easier for the student to follow his lectures. Therefore I greet these new arrivals with pleasure.

Curtis' *Text-Book of Gynecology*¹ attempts to give an essentially complete presentation of the subject in concise form. It is based on a record of personal experience. The arrangement of the subject matter differs from the orthodox form. This appears to have some advantages and also many disadvantages. The first section deals with infectious processes. The "cellulitis group" includes abortal and puerperal infections as well as cellulitis of other etiology. The next section covers tumors of the uterus. The subsequent one deals with tumors of the ovary. Succeeding chapters cover displacements and relaxation, disturbances of function, including the gynecological aspects of internal secretions. The next chapters are rather an "omnium gatherum," in that three different sections include special diseases and important symptom complexes, among which are grouped endometriosis, ectopic pregnancy, leucorrhea, fistulas, backache, disturbances of the pelvic veins, and physiology and pathology of the endometrium.

The next section, headed "Other Gynecological Diseases and Symptom Complexes" embraces such variegated subjects as lesions of the cervix, caruncles and prolapse of the urethra, carcinoma of the vulva, pruritis, vaginismus, gynatresia, malformations. The final section which deals with special topics, describes the gynecological patient, the early months of pregnancy, the appendix and large intestine, urinary problems in gynecology, radiotherapy, anesthesia, and postoperative care.

Among the subjects on which the author expresses a very definite opinion, the following may be mentioned. He discountenances active treatment in acute gonorrhea and is extremely conservative in the chronic forms, operating on less than 15 per cent. In hysterectomy, if drainage through the cervix is desired, he bisects it anteriorly. To aid in the diagnosis of endocervical lesions, incision of the cervix is recommended. For the treatment of carcinoma of the cervix, both hysterectomy with liberal removal of the vaginal tube and paravaginal tissues, as well as radium therapy are utilized. It is rather surprising that the author has not encountered a single case of chorionepithelioma in twenty years. In surgical correction of retrodisplacements, Curtis takes rather a radical stand, favoring operation where many gynecologists would not agree. Masturbation he considers as a possible cause of dysmenorrhea. I must disagree in considering corpus luteum cysts a cause of bleeding as in my experience they are more often followed by

¹A *Text-Book of Gynecology*. By A. H. Curtis. W. B. Saunders Co., Philadelphia, 1930.

amenorrhea. Few will agree with the author that "A smoothly healed hydrosalpinx encountered at operation may sometimes be left with advantage in case it cannot be removed without considerable effort or without likelihood of disturbing the ovarian circulation—provided always that the patient has had no pain in this region." This refers to patients whose uterus has been removed for fibroid tumors.

The illustrations, most of them from the pen of Tom Jones, are excellent. The entire book is to be recommended to teachers and students because of its brevity, directness, and clear exposition. The short bibliography at the end of each chapter will be appreciated.

C. Jeff Miller has written *An Introduction to Gynecology*² contained within 327 pages. It is an elaboration of the short student outline which the author published some three years ago. He limits its field to the use of beginning students and has divided it into sixteen sections which correspond to the sixteen sessions offered to the junior gynecological student. With this in mind only the vital essentials have been included and therapy not touched upon. Brief chapters on embryology, anatomy and physiology of the pelvic organs are given. The physiology of the menstrual cycle is entered into in great detail and Schroeder's conception of the endometrial changes is adhered to. The glands of internal secretion are next discussed, thus basing what follows upon our modern conception of endocrinology. A detailed discussion of the methods of examination and diagnosis of gynecological patients is covered in the next chapter, including laboratory examinations. I cannot agree to the wisdom of emphasizing the salpingography with lipiodol to the medical student. The Abderhalden test for pregnancy might well be deleted from the next edition, and the space now devoted to it added to the paragraph describing the Aschheim-Zondek test for pregnancy.

An excellent description of gonorrhea is offered to the student, excellent both because of its brevity and strikingly clear arrangement. Short descriptions of other inflammatory lesions are included in this chapter, among which are included leucoplakia, although this may not be based on strictly inflammatory etiology.

Chapter V covers inflammations and infections of the genital tract, exclusive of the tubes. It is perhaps a trifle misleading that chronic "endometritis," including hyperplasia, are described in this chapter although emphasis is placed on theory of Hitschmann and Adler in regard to the cyclical changes. Chapter VI deals with the inflammations of the tube in which the entire course, from the acute through the chronic stage, and the resulting residua are set forth with care.

The next chapter is devoted to birth injuries, in addition to which other obstetrical sequelae are featured. The next section takes up malpositions of the uterus, succeeding chapters dealing with neoplasms of the genital tract. The one covering carcinoma of the cervix is very detailed. Students may possibly be confused by the introduction of several histological classifications including that of Schottländer as well as that of Martzloff. An entire chapter is devoted to endometriosis. Ovarian cysts are grouped according to Gardner's classification. The final three chapters cover functional disorders among which is included probably with justice, ectopic gestation.

The entire book is well arranged and gotten up. Students should welcome this introductory work which reduces materially the labor of entering into the, to them, new subject of gynecology. The illustrations are numerous and well chosen. They have all been obtained from diverse sources to whom due credit is given.

—R. T. Frank.

²*An Introduction to Gynecology.* By C. Jeff Miller. The C. V. Mosby Co., St. Louis, 1931.

In the April issue of 1930 we had occasion to describe in detail *Factors in the Sex Life of Twenty-Two Hundred Women*,³ a noteworthy contribution to our knowledge on sex life. It will suffice, therefore, to announce here that this volume has now reached its eighth printing.

—Ehrenfest.

This impressive volume, *American Physicians and Surgeons*,⁴ of about 1500 pages represents a biographic directory of physicians and surgeons, mostly limiting their work to certain special fields, in the United States and Canada. Its purpose is to serve as source of desired information for the general public, doctors, hospitals, and public libraries. It will help the layman, if a newcomer in a certain locality, to select a reliable specialist, and will aid the physician when called upon to give advice to a patient moving to another city. As assured by the editor the selection of dependable and representative physicians in each locality was done on the basis of impartial study of their records, including scientific publications and official positions now held, and no price was charged for inclusion of any names. Competent to judge particularly the names of physicians mentioned as specialists in gynecology or obstetrics we can assert that in this respect the selection in general seems excellent. A supplement contains a classified list of the leading hospitals, sanitariums and health resorts of both countries.

The book, *The Behavior of the Newborn Infant*,⁵ is a summary of very careful work done at Ohio State University as a cooperative enterprise between the departments of psychology and obstetrics.

An objective analysis of the literature and results of former investigators is given in every chapter. The experiments were carried out in a specially constructed cabinet where the infants could be observed under the most detailed controls. The various stimuli were applied within the cabinet and movements and reactions recorded by sensitive instruments built on the outside of the cabinet. The data derived from these experiments are too numerous for a brief review.

The research according to the statement by the authors has produced more problems than it has solved. "It has suggested the possibility that a complete picture of activity, both quantitative and qualitative may reveal sex and race differences in behavior at this early stage when the environment is more uniform than it will ever be afterward. It has pointed out the futility of assuming that an infant's sensory reactions are similar to those of adults, and has shown that to speak at all confidently on this subject will require intensive experimentation in each sense field, with greater control and analysis of the exact nature and measurement of the physical stimuli. It has shown that a study of adaptive reactions (sucking, reactions to temperature, light, sound, smell, taste, etc.) will probably yield more significant results than the enumeration and description of fairly specific reflexes of little social significance."

The book is an extremely valuable contribution to child psychology. In the reviewer's opinion it is the first really scientific and thoroughly controlled study. As the authors themselves put it, the work is only the beginning of similar investigations of human behavior. "The work of the future has to describe the stages through which the infant passes in becoming a participating unit in the social organization."

—Paul J. Zentay.

³*Factors in the Sex Life of Twenty-Two Hundred Women*. By Katharine Bement Davis, Ph.D. Harper & Brothers, publishers.

⁴*American Physicians and Surgeons*. Edited by James Clark Fiffeld. The Midwest Company, Minneapolis, 1931.

⁵*The Behavior of the Newborn Infant*. Karl Chapman Pratt, Ph.D., Amalie Kraus-haar Nelson, Ph.D., and Kuo Hua Sun, Ph.D. (Ohio State University Studies), 1931.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

A REVIEW OF THE GYNECOLOGIC LITERATURE OF 1930

BY SYDNEY S. SCHOCHET, M.D., AND JULIUS E. LACKNER, M.D.,
CHICAGO, ILL.

(From the Division of Obstetrics and Gynecology, Michael Reese Hospital)

INTRODUCTION

EMPHASIS in this review of the gynecologic literature of 1930 is placed on the important rôle of chemistry and its subdivisions of molecular physics and biochemistry. It is of special interest to gynecologists to consider the general methods of attack of chemistry on the basic problems of hormones. Progress of greatest significance to the understanding of the perplexing function of menstruation, has been made through the application of chemistry to the study of the female sex hormone. Impressive as is this brilliant discovery (isolation of the female sex hormone) it is well to bear in mind, that the gaps in our knowledge of menstruation are far greater than any success attained, and that, it is a mistake to expect chemotherapy to accomplish more than can be reasonably expected of it in its present development.

The isolation of crystalline folliculin (theelin) will lead ultimately to the determination of its molecular structure and then to its synthetic preparation. In time other undiscovered active substances or hormones will be isolated and the complicated physiologic mechanism of uterine bleeding completely solved. Studies in biochemistry are the outstanding topics in the literature of 1930.

Some of the next great advances will be in molecular physics, and a knowledge of the negative charged atom of radioactive substances, which is now in the realm of the unknowable. It may, perhaps, be of some assistance to point out that Professor Sir J. J. Thomson of the Cavendish Laboratory has shown that the particles of the cathode rays have a mass not more than one-eighteenth hundredth part of that of a hydrogen atom. This type of basic knowledge will give us a clearer conception of the effect of irradiation on the molecule and on the effects of roentgen therapy.

Many valuable contributions to the study of menstrual disorders, malignancy, and problems in sterility were made during the past year. Fewer papers on new electrical devices for the treatment of endocervicitis were published due to a more sane and proper evaluation of these procedures.

GENERAL PROBLEMS

It is refreshing from time to time, to pause amid the fruits of our collective labors, and to evaluate the great advances during the past decade. In this field we are particularly concerned with that group of discoveries which seeks to illumine the physiology of menstruation and the great problem of new growths. These comprise only the beginning of the great advances to be made in gynecology. Here lie great possibilities for good or for evil. Progress in the field of gynecology will be stimulated if we maintain a sane appreciation of the discoveries and not consider the biologic facts in a one-sided manner. The biologic point of view, when rightly pursued, will elucidate our problems, but when viewed from the surface will confuse, cause chaos, and make our specialty a chemical tragedy.

It is impossible to cause voluntary modification of the sex. Yet Unterberger¹ advocates vaginal douches of bicarbonate of soda to produce male offspring, and the application of lactic acid solutions to the male organ to produce female offspring based on the theory of a variation in the hydrogen content of the vagina.

Brown² reviews the great victories gained in the field of gynecology, but rightly concludes that our present knowledge compared to all that can be known is ludicrously slight. The teaching of postgraduate gynecology and an inventory of the undergraduate's knowledge of gynecology are well analyzed and summed up by Dannreuther.³ It is not the intent of this author to indict the general surgeon as a pelvic and plastic operator, but it is an open question whether his knowledge fits him for duly considering the adaptation of treatment to pelvic symptomatology, the effects of a particular operation on the childbearing function; and the important factors that subsequently influence the patient's psychologic stability and domestic happiness.

More than a thousand papers⁴ have been published on the theory of the sedimentation reaction, and its practical applicability to differential diagnosis in adnexal lesions. Like the temperature, the change of rate of the erythrocytic sedimentation is an entirely nonspecific reaction of the organism. The increased rate of sedimentation is an agglutination phenomenon, that is due to a complex of factors of which the most important are chemical changes in the proteins and lipoids of the plasma; change in antibody contents of the serum; changes in the viscosity and surface tension of the blood; the size of the red blood cell; and several other factors which are not known. The increase in the sedimentation rate seems to express change in the plasma proteins toward coarse dispersion. Increases in fibrinogen and the amount of serum globulin which are associated among the decomposition products in cell disintegration, increase the sedimentation rate. In infections, the increased rate is due partly to the effect of bacterial toxins on the active mesenchyma, and partly to cell disintegration with the resulting change in plasma proteins toward coarse dispersion. Michael Nielson⁵ in a very careful and systematic study of the sedimentation test concludes that it is a diagnostic measure of essential significance in the differential diagnosis between tuberculous and nontuberculous salpingitis; adnexal infections and tubal abortions with slight or no intraperitoneal hemorrhage. It should be borne in mind that a single test is only of little value and that serial tests, on the other hand, will as a rule give valuable information.

In 34 cases of ectopic pregnancy studied by Jackson,⁶ the sedimentation test was slightly increased in 24; and markedly increased in 10 cases. Baer and Reis and other investigators feel, that the rate of sedimentation gives more reliable information than the white count. This view has been concurred in by Wystrom and Greisheimer⁷ in a study of 57 gynecologic patients by the Cutter and Linzenmeier methods. Dodds and Telfer⁸ found this test of limited value in obstetrics and of no value in the differential diagnosis between pelvic abscess and ectopic pregnancy, or in the diagnosis of malignant conditions. From a study of 102 cases of cancer, Adams-Ray⁹ concludes that the sedimentation reaction does not give a reliable basis for judging operability except in the cases in which it is very high; it then indicates an inoperable tumor.

From our observations we have been led to believe that the sedimentation test is of greater clinical value and significance than we attributed to it in our previous reviews.

In a well summarized study of morbidity and mortality following pelvic surgery, Dannreuther¹⁰ reviews 1,000 cases. The author reports a morbidity of 7.9 per cent and a mortality of 1.9 per cent. This paper presents an excellent outline of postoperative treatment, and a concrete analysis of morbidity.

The electrocautery is employed by the general surgeon for removal of tumors and for other surgical procedures. Gynecologists have failed to accept this innovation for the apparent reason that this non-cutting method produces extensive necrosis for a wide area about the line of incision. Gottesman and Ziegler¹¹ have studied the effect on animals and conclude that there is extensive necrosis and that the incision heals slowly with frequent suppurations.

Kolischer¹² describes the value of diathermy in gynecology and rightly cautions against extravagant claims concerning its efficacy and the results obtained in gonorrheic infections. This is an excellent résumé of the subject of diathermy.

Baldwin¹³ outlines the methods of prevention of adhesions and sums up the teachings of good abdominal surgery in a word, peritonealization. In experimental work with amniotic fluid, Giordanengo¹⁴ found that it does not prevent postoperative peritoneal adhesions, but causes a reaction analogous to heterogenous proteins. In cases of submucous fibroids it is not infrequent that menstrual blood is refluxed into the peritoneal cavity with the formation of peritoneal adhesions. Candela¹⁵ describes a case of hemoperitoneum. Surgical scarlet fever is not an uncommon condition, and yet it is very striking that only a comparatively few cases have been reported following abdominal operations. Greenhill¹⁶ collected 32 cases in the literature and added eight unreported cases which occurred in Chicago.

Although numerous papers have been published on the innervation of the uterus since the epochal work of E. Kehrer and Waddell yet there still appears to be a divergence of opinion as to the true innervation of the uterus. Dyreff¹⁷ offers a very admirable dissertation on this subject and emphasizes the antagonism between the parasympathetic systems.

Pain in the lower quadrant is often erroneously attributed to the pelvic organs. Rubenstone¹⁸ cites many cases in which the referred pain was due to the sacroiliac joints. Lesions of the vulva with pru-

ritus ani and anal fissure are readily corrected by local injections of alcohol, anesthesin and ether according to the work of Gabriel.¹⁹ (We have not had such successful results.)

Gonococcal bacteremia with localized areas of infection is best treated surgically according to Wheeler and Cornell.²⁰ (Surgical intervention is not undertaken in our services in the presence of an active acute lesion except in cases where drainage of abscesses [posterior-colpotomy] is indicated.)

In a series of systematic studies Murphy and Goldstein²¹ have conclusively shown that postconception radiation produces a high percentage (33 per cent) of gross deformities in the offspring. These studies have been confirmed in another group of experiments on the albino rat in which Murphy and de Renyi²² find that there was a clubbing of feet or absence of toes in 5 of the 34 litters. This condition seldom occurs in nonradiated animals. Deformities of the extremities were reported in 5 per cent of fetuses in women irradiated during pregnancy.²¹ This condition should not be confused with pre-conceptional pelvic irradiation, as no known effect on the development of future offspring was found by Findley.²³ Six cases of pseudomyxoma peritonei are reported by Mason and Hamrick²⁴ due to mucocoele of the appendix. Old inflammation of the appendix appears to be a large factor in the production of mucocoele. Brady²⁵ calls attention to the not uncommon occurrence of extraperitoneal lesions that are frequently confused with lesions of pelvic organs.

Alfieri²⁶ gives a systematic analysis of operations in the Gynecologic Clinic of Milan; 1192 cases of celiotomy and 50 vaginal operations were performed with a mortality of 3.6 per cent, and a direct mortality of 2.36 per cent due to the operations. (These statistics are very similar to ours and to the findings of the larger clinics in America.)

We are indebted to Spirito²⁷ and a group of other Italian workers²⁸ for studies on the reticulo-endothelial system of the pelvic organs. Volpe²⁹ finds that the serum of pregnant women produces a reaction in this system which is most marked in eclamptics. (There is little doubt that we have underestimated the importance of the reticulo-endothelial system in the defense mechanism of the pelvic organs.)

Stein and Arens³⁰ report their studies of pneumoperitoneum in 470 cases; in 150 iodized oil was employed. The authors report no untoward results in their series. There is an interesting case of perforation cited by Stein³¹ in which the uterus was penetrated by a crochet needle in an attempted abortion.

ANESTHESIA

Since the advent of anesthesia³² various agents and combinations of them have been employed and favored by enthusiasts for each type. Recent advances in methods and agents have popularized ethylene, a safe anesthetic but which does not produce quite so complete a relaxation as ether. (Although this is an important factor to gynecologists we have been rather slow in drawing practical conclusions from these facts. We believe that local infiltration and spinal anesthesia are the ideal anesthetics for gynecologic surgery.)

Falls³³ presents a very careful study of local and infiltration anesthesia for gynecologic cases and concludes, that it is the method of

choice in noncomplicated and in carefully selected complicated cases; and that nearly every type of gynecologic operation can be done under local anesthesia when reinforced by scopolamine and morphine. Arcieri³⁴ finds that a successful local anesthesia of the ganglion of Frankenhäuser and of the internal pudendal nerve is sufficient to perform any operation on the cervix, vagina, and perineum.

A comparative study of anesthetics for surgical operations has convinced Gellhorn³⁵ that local infiltration anesthesia is safer than inhalation narcosis. Gellhorn reports 82 vaginal hysterectomies under infiltration anesthesia with three deaths. Only one of these can be attributed to the operation or anesthetic.

At The Mayo Clinic³² intravenous sodium-iso-amyl-ethyl barbituric acid (sodium-amytal) has been used in over 700 cases without a mortality. Mason and Baker³⁶ present an extensive review, and describe the technic of intravenous use of sodium amytal. The authors conclude that there are no contraindications to the use of this drug except in cases of extreme shock, uremic coma, diabetes or respiratory obstruction.

Rectal administration of avertin is reported by Young³⁷ as an ideal anesthetic when supplemented by the inhalation of ether, gas and oxygen. The author records no ill effects in 345 unselected hospital and private cases. Lundy³⁸ has employed this new general anesthetic with good results. Franken³⁹ observed that avertin lowered the respiratory function by about 40 per cent for two hours following its introduction. The use of avertin narcosis without proper facilities for administering carbon-dioxide is characterized by the author as negligence. (We have had no personal experience with this anesthetic but our reaction to the reports on avertin convinces us that it is still in the experimental stage.)

It is evident that we should not be limited in the selection of an anesthetic in gynecology any more than we would employ a fixed type of operation for all cases of prolapse. In the aged or debilitated patients a general anesthetic is often contraindicated either by lesions in the kidneys, heart and blood vessels, or by disturbances of a metabolic character. For this group of cases local or spinal anesthesia involve less danger and are ideal methods. We have used spinal anesthesia in a very large group of cases with only a few minor complications. However, there have been numerous fatalities published following this procedure. Statistics from clinics in which spinal anesthesia is used routinely show a much lower death rate than those from hospitals where this method is used only occasionally. In a discussion of this subject before the Society of Surgery in Paris in 1923-24, there were mentioned ten deaths due to spinal anesthesia in 20,267 cases. Koster and Weintrob⁴⁰ report 6000 general surgical cases with 6 deaths from spinal anesthesia.

Iason, Lederer and Steiner⁴¹ have studied the spinal fluid eighteen hours after spinal anesthesia and found a definite pleocytosis in 11 of 14 cases; and an increase of 37.3 per cent of the spinal fluid sugar. The authors conclude that the pleocytosis indicates a certain amount of irritation of the serous lining of the subarachnoid space. Nelson⁴² believes that leakage is an important factor in the postpuncture headache. In a study of the effect of spinal anesthesia on cardiac output, Burch and Harrison⁴³ conclude that the heart and venous return are

affected secondarily and the symptoms are comparable to primary shock or collapse. Campbell,⁴⁴ King,⁴⁵ and Jones⁴⁶ conclude that spinal anesthesia is an ideal anesthetic for abdominal operations. In operations for cancer of the rectum, Jones found that the surgical procedure would be much more difficult and in some cases (obese patients) impossible without spinal anesthesia.

Sacral anesthesia in gynecology has not received the attention this method deserves. Wong⁴⁷ believes that sacral, epidural, extradural or caudal anesthesia is the safest and best method of producing local anesthesia in the regions of the sacral nerves. The reviewers have employed spinal anesthesia in cesarean sections and find that there is no greater danger either to mother or child than with local anesthesia. Featherstone⁴⁸ is also of the opinion that spinal anesthesia has an important place in the technic of cesarean section. Intraspinal injections do not inhibit the contractions of the uterus, but Bourne and Burns⁴⁹ concluded that they interfere with full uterine relaxation between the pains.

BREASTS

A review of the gynecologic literature would be incomplete without reference to the breasts. These organs are modified sweat glands and accessory glands to the organs of reproduction. Their activity at birth is due to the presence of the female sex hormone in the fetal blood (Schochet, Laekner and Gustavson). The physiologic function is greatest during lactation, pregnancy and the menstrual period in the order named. Bainbridge⁵⁰ believes that there is a definite relationship between intestinal toxemia and abnormal changes in the breast.

Ultraviolet irradiation has been tried on the breast to increase the lactation, but contrary to reports in the literature, Küstner and Borner,⁵¹ were unable to increase the flow of milk in 21 lactating women. Ries⁵² cites a case of abscess formation in the breast following lipiodal injection into the milk ducts. Three cases of fat necrosis of the breast attributed to disturbances of the endocrine organs are reported by Braneati.⁵³

While syphilitic lesions do not occur very frequently in the internal organs of reproduction they are occasionally found in the mammary glands. Primary lesions on the nipple, or gummas may occur. Akaiwa⁵⁴ describes a case of gumma of the breast which occurred eleven years after the primary infection.

Prolapse of the breast containing nonmalignant nodules is not uncommon. This condition is due to the present fashion in dress. Farrar⁵⁵ concludes that plastic operations are unnecessary mutilations and that the prolapse can be corrected with proper uplifting support if the treatment is instituted before there is marked sagging of the breasts.

GENITOURINARY SYSTEM

The epithelium of caruncles of the female urethra shows enough infolding to make its benign character seem doubtful to one not familiar with its structure. Olcott⁵⁶ found compound acinar glands in the urethra of 17 out of 23 cases and believes that they may be an important factor in the formation of caruncles. (This description is at

variance with the common teachings of pathology. Caruncular growths are papillary angiomas and occasionally contain tubular glands described by Gebhard.)

Irritability of the bladder during the climacteric is a reflex neurosis due to overstimulation of the sympathetic nervous system, and, according to Lindenberg⁵⁷ responds to calcium and organotherapy.

Uroselectan is a safe method of determining a normal or diseased condition of the genitourinary tract in the pregnant and nonpregnant states.⁵⁸ According to Ottow⁵⁹ it is a valuable adjunct in the diagnosis of the fistulas of the ureter, in determining whether transplanted ureters are patent, and useful in cases where it is impossible to make a pyelogram by ureteric injection. Van Duzen⁶⁰ examined cystoscopically various types of cystocele and frequently found a separation of the vesical fascia and injury to the trigone. Gottlieb⁶¹ treats small vesicocervical and vesicovaginal fistulas with electrocoagulation. According to Ottow⁶² only the smallest fistulas with the least amount of scar formation will heal with this procedure. If the first attempt at electrocoagulation is not successful, it is useless to repeat this procedure. In the treatment of vesicovaginal fistulas, Fornero⁶³ completely mobilizes the bladder and dissects the prevesical fascia from the vaginal wall. (We believe that surgical procedures are par excellence in the treatment of vesicovaginal fistulas.)

Kahn and Walker⁶⁴ advise a cystoscopic examination previous to any elective gynecologic operation. (This routine procedure is over-emphasized.)

Ligature stones of the female bladder are infrequent since the more common use of absorbable sutures in place of linen, silk, or silver, which cause incrustations. Ottow,⁶⁵ like many others, has found infected sutures from pelvic operations penetrating the bladder wall. The diagnosis was made cystoscopically, and removal of the stitch cured the cystitis. In operations performed in close proximity to, or involving, the bladder wall, Craig⁶⁶ warns against postoperative distention. Bissell⁶⁷ agrees with Grelonsky⁶⁷ that most bladder hemorrhages, which follow rapid emptying of a distended bladder, are due to chronic lesions of the bladder wall rather than to the sudden emptying of the overdistended organ.

Subsequent to every implantation of the ureter, Stoeckel⁶⁸ suggests a cystogram and an intravenous pyclogram to determine the operative result. He cites a case in which a reflux was not diagnosed previous to the employment of the above procedure.

For severe incontinence, Smith⁶⁹ advises a plastic on the sphincter urethrae, with the interposition operation. Newman⁷⁰ has devised a very ingenious method of inverting the uterus and using the cervical and uterine canal as an urethra where the entire floor of the bladder was extensively torn and the urethra completely lacerated.

For thirty years Stoeckel⁷¹ has encouraged gynecologic urology and emphasized the importance of a study of the urinary organs. During the past twelve years, he has operated upon 50 cases of tuberculosis of the genitourinary organs; 10 pyo-, and 2 hydronephroses; 12 cases of kidney stone; 4 kidney tumors; 12 cases of bladder stones; 4 bladder resections; 11 bladder tumors; 51 bladder fistulas, and 45 cases of incontinence.

EXTERNAL GENITALIA

According to R. Schroder⁷² vaginal bacteria change their morphologic forms with the variation in degree of acidity. Acidophilic bacteria (such as Döderlein's bacilli) in weakly acid secretion, change into cocci, and chained cocci may alter their form and become diplococci or short bacilli or even diplococci. The vagina is kept acid by the sugars secreted into the vagina. If the high acidity is interfered with the vaginal flora changes. On account of its acid reaction, the vaginal wall withstands infection well. (These observations differ from the accepted teachings in bacteriology.)

Dierks⁷³ is of the impression that the parallelism of cyclical changes in the vagina and in the uterine mucosa is the result of hormone action. According to Geist⁷⁴ there are individual differences in the vaginal cycle as also observed in ovarian and uterine cycles. Temple, Stein, and Schochet⁷⁵ have shown that there are rhythmic contractions in the vagina which are effected by the menstrual cycle.

Arnold⁷⁶ reports a case of Vincent's disease of throat and vagina complicating an agranulocytosis. This is the only authentic case of this sort recorded in the literature during the past thirty-five years. The fusiform bacilli and spirilla are different forms in the life cycle of this organism. Ottow⁷⁷ describes a case of vaginitis with ulceration, and membrane formation complicating agranulocytosis.

Mathieu⁷⁸ noticed that the trichomonas vaginalis lost its motility when in contact with hexylresorcinal and reports some gratifying results with hexylresorcinal in the treatment of this condition. Kleegman⁷⁹ suggests pyroligneous acid (full strength) with Lassar's Paste pack as the best form of treatment. Furniss⁸⁰ feels that daily 1-4000 bichloride of mercury douches (also during the menstrual period) give the best results. (Before we know the method of introduction of the trichomonas into the vagina, we can never assure our patients that they will not have recurrences. Apparently every author has his own favorite treatment for this condition. One of us [Schochet] does not consider the trichomonas a pathogenic organism.)

In the treatment of gonorrheal vaginitis, Herrold, Hoffman and Blatt⁸¹ employ the intracutaneous injections of first and second generations of live gonococci at weekly intervals. Within four to six weeks, they report, 80 per cent of the cases were free of gonococci and thus clinically cured. Brown⁸² reports 118 cases of gonorrheal vaginitis, 46 of which were discharged cured. The average period of treatment was sixty-seven weeks. Andreitschuk⁸³ introduces pure cultures of *Bacillus vaginalis* into the vagina in his treatment of vaginitis. In a series of 35 cases, 20 were cured, 13 improved, and in two there were no changes.

Iribarne and Sardi⁸⁴ record success in the treatment of pruritus vulvae with radioactive mud. Polzl⁸⁵ uses vaginal suppositories of irradiated fats in the treatment of leucorrhea and claims considerable success. (We question the value of either procedure.)

Maxwell and Van Gorder⁸⁶ in a very interesting paper, describe an operation for the relief of compression of the vagina due to osteomalacia. In these two cases marital relations were impossible. The operation involves the removal of the descending ramus of the pubes, the ascending ramus of the ischium, and part of the ischial tuberosity

on the left side. The stability of the pelvic girdle was not endangered nor was there a subsequent disability. (This operation indicates great ingenuity.)

Sarcoma of the vagina is rare. McFarland⁸⁷ collected 101 cases from the literature in 1911. According to Tracy⁸⁷ a large percentage of the cases is found in childhood as sarcoma botryoides; 31.8 per cent develop during the second year of life; and 60 per cent were in adults.

Stoeckel⁸⁸ gives a very thorough and detailed résumé of the treatment of carcinoma of the vulva. In the past he had cauterized the growth, then made an incision from one anterior superior spine to the other, dissecting out all fat and superficial and deep glands, circumcising and removing the vulva at the same time. He strongly recommends the dissection of glands from the periphery toward the tumor with the removal of skin and tumor in toto. He advises against resection of the healthy urethra in these cases. The objections to this operation are the time factor (one and one-half to three hours), the danger of infection, and the later trophic disturbances in the skin. Of cases reported in German literature that were treated with radium and x-ray, 11.9 per cent were cured for a five-year period. With the radical operation, 27 per cent were cured for five years. Stoeckel⁸⁸ suggests the following treatment in future cases: Treat the primary tumor with radium, remove the glands radically by operation, and radiate the lower abdomen. If the primary tumor is refractory to radium, then radical removal is indicated. The recurrences to be treated with electrocoagulation. The incidence of cancer of the vulva can be reduced 50 per cent by timely removal of a precancerous lesion. Taussig⁸⁹ advises a complete vulvectomy with the removal of the lymph glands for carcinoma of the vulva.

Hinselmann⁹⁰ noticed an increase in the number of papillae in leucoplakia. Rogge⁹¹ feels that the differential diagnosis of leucoplakia from carcinoma is extremely difficult, for leucoplakia is precancerous. (An experienced pathologist can differentiate carcinoma from leucoplakia.) In inflammatory diseases, in which the process remains progressive in spite of conservative or surgical treatments, one should suspect actinomycosis of the vulva. Martins and Schugt⁹² advise roentgen therapy and the oral administration of iodides for this disease, which always has a grave prognosis. (The vulva, with its exposure to skin germs and its proximity to the three great excretory orifices of the body, exhibits surprisingly little pathology. This is apparently due to a local immunity of the vulval region.)

Miller⁹³ is of the opinion that the present treatment for the various pathologic conditions of the vulva is far from satisfactory. Retention cysts of Bartholin glands are discussed by Lehmann.⁹⁴

Haun⁹⁵ reports a case of multiple cysts of the vagina due to inflammatory processes which Meyer⁹⁵ classifies as fibroadenomatous endometrial growths.

The important principles in the treatment of vesicovaginal fistulas, outlined by C. Jeff Miller,⁹⁶ are free accessibility, visibility, separate sutures for bladder and vagina, the use of silver wire, and the pre- and postoperative treatment.

Bjorkenheim⁹⁷ reports six cases of rectovaginal fistulas operated upon. The most difficult case was a fistula situated high up in the

left fornix of the vagina. This was repaired by the combined abdominal and vaginal method advocated by Legeicu.

Kirschner and Wagner⁹⁸ prefer the skin flap in making an artificial vagina. With the use of the intestine the authors fear incontinence, fistulas, and strictures. Frankenberg⁹⁹ used the sigmoid for making an artificial vagina and reported four successful operations out of five. He prefers the sigmoid to the small intestine which Baldwin suggests, because its blood supply is not interfered with, because the sigmoid secretes less mucus and is more distensible than the small bowel.

(To be continued in September.)

REFERENCES

- (1) Deutsche med. Wchnschr. 56: 304, 1930. (2) AM. J. OBST. & GYNEC. 19: 153, 1930. (3) AM. J. OBST. & GYNEC. 19: 241, 1930. (4) Acta obst. et gynec. Scandinav. 10: 102, 1930. (5) Clin. obst. et gynaecc. Universitatis Hafniensis. Collected Papers 6: 201, 1930. (6) J. Obst. & Gynec. Brit. Emp. 37: 547, 1930. (7) AM. J. OBST. & GYNEC. 19: 806, 1930. (8) J. Obst. & Gynec. Brit. Emp. 37: 286, 1930. (9) Acta Chir. Scandinav. 66: 263, 1930. (10) Surg. Gynec. Obst. 51: 522, 1930. (11) Surg. Gynec. Obst. 51: 667, 1930. (12) AM. J. OBST. & GYNEC. 19: 550, 1930. (13) Am. J. Surg. 8: 1187, 1930. (14) Ann. ital. di chir. 9: 543, 1930. (15) Ann. di ostet. 51: 1501, 1929. (16) Am. J. Surg. 8: 1015, 1930. (17) Arch. f. Gynäk. 138: 362, 1930. (18) J. A. M. A. 95: 1803, 1930. (19) Brit. M. J. p. 311, 1930. (20) Ven. Dis. Inform. 11: 335, 1930. (21) Surg. Gynec. Obst. 50: 79, 1930. (22) Surg. Gynec. Obst. 51: 861, 1930. (23) J. A. M. A. 95: 857, 1930. (24) Surg. Gynec. Obst. 51: 1023, 1930. (25) J. A. M. A. 95: 338, 1930. (26) Ann. di ostet. e Ginec. No. 5, 411, 1930. (27) Estratto dagli atti della società Ital. di ostet. e ginec. 28: 1929. (28) Arch. di ostet. e ginec. 16: 633, 1929. (29) Arch. di ostet. e ginec. 16: 989, 1929. (30) J. Radiol. Soc. North Amer. 15: 85, 1930. (31) AM. J. OBST. & GYNEC. 20: 867, 1930. (32) Surg. Gynec. Obst. 50: 117, 1930. (33) AM. J. OBST. & GYNEC. 20: 310, 1930. (34) Ann. di ostet. 52: 176, 1930. (35) AM. J. OBST. & GYNEC. 20: 484, 1930. (36) Surg. Gynec. Obst. 50: 828, 1930. (37) Lancet 218: 1177, 1930. (38) Minnesota Med. 13: 223, 1930. (39) Arch. f. Gynäk. 140: 496, 1930. (40) Am. J. Surg. 9: 234, 1930. (41) Surg. Gynec. & Obst. 51: 76, 1930. (42) Arch. Dermat. & Syph. 21: 65, 1930. (43) Arch. f. Surg. 21: 330, 1930. (44) J. Urol. 24: 279, 1930. (45) National Med. J. China 16: 711, 1930. (46) J. A. M. A. 95: 1172, 1930. (47) National Med. J. China 16: 723, 1930. (48) J. Canad. M. A. 23: 505, 1930. (49) Brit. M. J. 2: 87, 1930. (50) AM. J. OBST. & GYNEC. 19: 255, 1930. (51) Monatschr. f. Geburtsh. u. Gynäk. 84: 275, 1930. (52) AM. J. OBST. & GYNEC. 20: 414, 1930. (53) Arch. ital. di chir. 26: 585, 1930. (54) Beitr. z. klin. Chir. 150: 18, 1930. (55) J. A. M. A. 95: 1329, 1930. (56) Surg. Gynec. Obst. 51: 61, 1930. (57) AM. J. OBST. & GYNEC. 19: 562, 1930. (58) Zentralbl. f. Gynäk. 54: 1424, 1930. (59) Zentralbl. f. Gynäk. 54: 2508, 1930. (60) Southern Med. J. 23: 580, 1930. (61) Zentralbl. f. Gynäk. 54: 1090, 1930. (62) Zentralbl. f. Gynäk. 54: 1093, 1930. (63) Arch. di ostet. e ginec. 17: 185, 1930. (64) AM. J. OBST. & Gynec. 20: 683, 1930. (65) Zentralbl. f. Gynäk. 54: 1513, 1930. (66) Int. Surg. Digest. 9: 297, 1930. (67) AM. J. OBST. & GYNEC. 20: 811, 1930. (68) Zentralbl. f. Gynäk. 54: 2517, 1930. (69) Ann. Surg. 92: 394, 1930. (70) J. A. M. A. 94: 400, 1930. (71) Zentralbl. f. Gynäk. 54: 1112, 1930. (72) Deutsche med. Wchnschr. 27: 1, 1930. (73) Zentralbl. f. Gynäk. 54: 1882, 1930. (74) Surg. Gynec. Obst. 51: 848, 1930. (75) In Press. (76) J. A. M. A. 94: 1461, 1930. (77) Zentralbl. f. Gynäk. 54: 484, 1930. (78) Northwest Med. 29: 15, 1930. (79) Surg. Gynec. Obst. 51: 552, 1930. (80) AM. J. OBST. & GYNEC. 20: 93, 1930. (81) Ven. Dis. Inform. 11: 397, 1930. (82) Lancet 1: 752, 1930. (83) Monatschr. f. Geburtsh. u. Gynäk. 86: 48, 1930. (84) Boletín de la Soc. de Obst. y Ginec de Buenos Aires 9: 259, 1930. (85) Wien. klin. Wchnschr. 43: 272, 1930. (86) Nat. Med. J. China 16: 739, 1930. (87) AM. J. OBST. & GYNEC. 19: 279, 1930. (88) Zentralbl. f. Gynäk. 54: 47, 1930. (89) Arch. Dermat. & Syph. p. 431, 1930. (90) Ztschr. f. Geburtsh. u. Gynäk. 97: 43, 1930. (91) Zentralbl. f. Gynäk. 54: 594, 1930. (92) München. med. Wchnschr. 77: 394, 1930. (93) Am. J. Surg. 8: 368, 1930. (94) Zentralbl. f. Gynäk. 54: 176, 1930. (95) Ztschr. f. Geburtsh. u. Gynäk. 98: 535, 1930. (96) New Orleans M. & S. J. 82: 850, 1930. (97) Acta Obst. et Gynec. Scandinav. 9: 58, 1930. (98) Zentralbl. f. Gynäk. 54: 2690, 1930. (99) Arch. f. Gynäk. 140: 226, 1930.

Correspondence

TREATMENT OF FORCEPS MARKS IN THE NEWBORN

To the Editor.—When I was a house officer in the Lying-In Hospital, I was impressed by the number of babies who, after difficult forceps deliveries, were left with abrasions, contusions, and lacerations of the scalp and face. Ultimately, I was allowed to do forceps deliveries and found that I, too, caused similar injuries. These injuries are always a distress to a physician and, it is needless to say, to the parents as well, for, although you can assure the parents that most of the marks will disappear, some of them take a good while to do so and others leave permanent disfigurements.

One baby who was much marked by a pressure groove running from the cheek to the scalp caused me so much anxiety that I was unwilling to hand him to the nurse without attempting to do something. Therefore, I kept him in my lap and began to massage the deep grooves left by the forceps. To my surprise, I found that after four or five minutes of treatment the marks practically disappeared. During the rest of my house officer's service, I experimented with every baby who had marks following a forceps delivery by me or under my supervision. In some instances, I treated one side of the face and not the other. I found that the side treated appeared normal on the next day, while the side untreated became discolored and maintained its marks practically during the stay of the child in the hospital. In cases where the skin had actually been cut through, the untreated areas left permanent depressed scars while the treated areas healed by first intention and disappeared. In a case where there had been possible nerve injury so that the baby's eye did not close normally, circulation was restored and pressure on the nerve was apparently relieved by this friction so that at the end of the treatment both eyes opened and closed normally and equally. During years of practice since then I have continued to use this method and have advised those men associated with me to practice it.

Immediately after the baby is delivered, the cord tied, and the uterus controlled by the nurse (even before the expulsion of the placenta), the baby receives my attention. If there are any forceps depressions, depressed contusions, or scarring, the injured area is rubbed gently but firmly with a wet sponge. The vernix caseosa acts as a lubricant so that the gauze does not cause undue friction on the skin. Firm massage is continued for four or five minutes until all of the depressions have disappeared and the skin has resumed a normal appearance, although a little redder than the unfriktioned skin. If any actual cuts in the skin are present, I paint them with 2 per cent mercurchrome solution.

I believe that if this method of treatment was applied to every baby having superficial forceps injuries of the head and face after delivery, physicians would be saved a good deal of distress, the parents a great deal of worry, and the babies themselves would be permanently benefited.

HILBERT F. DAY, M.D.

412 BEACON STREET, BOSTON, MASS.

Item

American Board of Obstetrics and Gynecology REPORT OF ANNUAL MEETING AND EXAMINATION, PHILADELPHIA, JUNE 6, 1931

The American Board of Obstetrics and Gynecology held the second section of its first examination of applicants for certification at Philadelphia, June sixth, prior to the annual meeting of the American Medical Association. The first or written examination was held on March fourteenth in various cities of the United States and Canada, and this latter was the oral or clinical examination before the entire Board.

Seventy-four applicants reported for examination, and of this number sixty-nine qualified and five failed to pass.

A limited number of applicants were approved at this meeting without examination. In granting such approval preference has always been given to men who are heads or associates of teaching departments in obstetrics and gynecology in Class A medical schools, or are Fellows of one or both of the two national special societies sponsoring this Board. Exceptions to the above have occasionally been made for outstanding reasons.

The Board has now voted to abolish entirely as of December 31, 1931, all further certification under Group I classification of applicants, i.e., without examination because of eminence in the specialty.

The parent organizations of this Board, namely, the American Gynecological Society, the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, and the Section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association, feel certain that its activities under their direction will rapidly exert a more and more profound influence in improving the standards of specialization in these branches. It is to be expected that the certification of the obstetrical and gynecological specialist by this Board and its list of diplomates will soon be a generally and widely used means of distinguishing between those who are well qualified in their claim of being specialists and those who are not.

Notices of time and place of future examinations will appear in various medical journals. It is urged that all qualified obstetricians and gynecologists make application as soon as possible.

Information and application blanks may be obtained from the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Pa.

List of Diplomates Approved by the American Board of Obstetrics and Gynecology, at Philadelphia on June 6, 1931.

Almy, Thomas, Fall River, Mass.
Andrews, C. J., Norfolk, Va.
Aranow, Harry, New York, N. Y.
Behney, C. A., Philadelphia, Pa.
Bickel, D. A., South Bend, Ind.
Black, W. T., Memphis, Tenn.
Bristol, D. J., Jr., Boston, Mass.
Broder, N. E., New York, N. Y.
Burch, L. E., Nashville, Tenn.
Clifford, J. S., Rochester, N. Y.

Cogan, G. E., Hartford, Conn.
Conoway, W. P., Atlantic City, N. J.
Cosgrove, S. A., Jersey City, N. J.
Cowles, G. E., Wichita, Kansas
Darnall, W. E., Atlantic City, N. J.
Davis, G. H., Brooklyn, N. Y.
Edwards, E. A., Chicago, Ill.
Ely, W. C., Philadelphia, Pa.
Fischman, E. W., Chicago, Ill.
Fox, Paul C., Oak Park, Ill.

- Frankenthal, L. E., Jr., Chicago, Ill.
 Gardiner, John P., Toledo, Ohio
 Gibson, Gordon, Brooklyn, N. Y.
 Goldberger, Morris A., New York, N. Y.
 Good, Frederick L., Boston, Mass.
 Goodman, Sylvester, J., Columbus, Ohio
 Grier, Robert M., Evanston, Ill.
 Guffey, D. C., Kansas City, Mo.
 Gustafson, G. W., Indianapolis, Ind.
 Hagstrom, Henry T., Brooklyn, N. Y.
 Heffernan, Roy J., Boston, Mass.
 Hellman, Alfred M., New York, N. Y.
 Hershman, Abram A., New Haven, Conn.
 Hesselstine, H. C., Iowa City, Ia.
 Hornstein, Mark, New York, N. Y.
 Huntington, James L., Boston, Mass.
 Hyams, Mortimer N., New York, N. Y.
 Jackson, D. L., Boston, Mass.
 Jacobs, J. Bay, Washington, D. C.
 Janney, James C., Boston, Mass.
 Jarcho, Julius, New York, N. Y.
 Jones, H. O., Chicago, Ill.
 Judd, A. M., New York, N. Y.
 Kickham, Edward L., Boston, Mass.
 Kimbrough, Robert A., Philadelphia, Pa.
 Knipe, W. H. W., New York, N. Y.
 Koeyan, Joseph J., Wilkes Barre, Pa.
 Krigbaum, Roy E., Columbus, Ohio
 Lash, Abraham F., Chicago, Ill.
 Lazard, E. M., Los Angeles, Calif.
 Lewis, R. M., New Haven, Conn.
 Lilienfeld, Michael C. C., New York, N. Y.
 Lobsenz, Moses, New York, N. Y.
 Lubin, Samuel, Brooklyn, N. Y.
 Lynch, Frederick J., Boston, Mass.
 McCullough, Francis J., Philadelphia, Pa.
 McMahon, J. J., New York, N. Y.
 Manley, James R., Duluth, Minn.
 Mencken, Harry P., Astoria, L. I., N. Y.
 Miller, Julius A., New York, N. Y.
 Miller, Norman F., Iowa City, Iowa
 Miller, Theodore, Cleveland, Ohio
 Moore, W. G., San Francisco, Calif.
 Mount, Walter B., Montclair, N. J.
 Murray, Peter M., New York, N. Y.
 Pemberton, F. A., Boston, Mass.
 Philip, Albert, New York, N. Y.
 Pierce, James M., Ann Arbor, Mich.
 Potter, Milton G., Buffalo, N. Y.
 Proctor, I. M., Raleigh, N. C.
 Raymond, Walter C., Johnstown, Pa.
 Roblee, Melvin A., St. Louis, Mo.
 Robinson, M. R., New York, N. Y.
 Rosenfeld, Samuel S., New York, N. Y.
 Sage, Earl C., Omaha, Neb.
 Schaufler, Goodrich C., Portland, Oregon
 Sears, Nathan P., Syracuse, N. Y.
 Shay, Edward F., Fall River, Mass.
 Smith, Philip H., Evanston, Ill.
 Stander, H. J., Baltimore, Md.
 Stevenson, James W., Pittsburgh, Pa.
 Storrs, Ralph W., Hartford, Conn.
 Taylor, James S., Altoona, Pa.
 Thompson, Hartwell G., Hartford, Conn.
 Tracy, S. E., Philadelphia, Pa.
 Truex, Samuel L., Middletown, N. Y.
 Walker, Robert B., New Brunswick, N. J.
 Weiner, Morris, Denver, Colo.
 Wilens, Ira, New York City

The next written examination for applicants for Certificate from the American Board of Obstetrics and Gynecology will be held in the following cities on Saturday, October 31, at 2 P.M., under the direction of the examiners and assistant examiners of the Board.

New York City
 Chicago
 Philadelphia
 Toronto, Canada
 Indianapolis, Ind.
 Portland, Oregon
 Rochester, Minn.
 Iowa City, Iowa
 St. Louis, Mo.

Boston, Mass.
 Ann Arbor, Mich.
 Baltimore, Maryland
 Atlanta, Ga.
 Cincinnati, Ohio
 San Francisco, Cal.
 Grand Forks, North Dakota
 Denver, Colorado
 Galveston, Texas

The examination will consist of ten questions on obstetrics and gynecology; is for Group III candidates and must be accompanied by fifty case records. Group II candidates are not required to take this examination nor to provide case records, and notice of the next oral and clinical examination for all applicants will be published at a subsequent date. For further information and details apply to the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Penn.

Books Received

HORMONE DES OVARIUMS UND DES HYPOPHYSENVORDERLAPPENS. Von Dr. Bernhard Zondek, Professor der Geburtshilfe und Gynaekologie an der Universitaet Berlin. Mit 121 zum Teil farbigen Abbildungen. Berlin. Verlag von Julius Springer, 1931.

ARZNEI-, DIAETETISCHE, ETC. VERORDNUNGEN fuer die Gynaekologisch-geburthilfliche Praxis. Von Professor Paul Strassmann, Universitaet Berlin. Fuenfte, umgearbeitete und erweiterte Auflage. Leipzig. Verlag von Georg Thieme, 1931.

EASIER MOTHERHOOD. By Constance L. Todd. New York. The John Day Book Co., 1931.

STILL-BIRTH AND NEONATAL DEATH IN INDIA. By Christine J. Thomson, M.D., Ph.D. London, H. K. Lewis & Co., Ltd.

LES DIAGNOSTICS ANATOMO-CLINIQUES. Appareil Genital de la Femme. Premier Partie. Par P. Moulonguet et S. Dobkevitch. Masson et Cie, editeurs. Paris, 1931.

STUDIEN ZUR FERTILITAET. Von Professor Dr. G. L. Moench, New York Post Graduate School and Hospital. Mit 24 Abbildungen und 14 Tafeln. Verlag von Ferdinand Enke, Stuttgart, 1931.

INDIKATIONEN ZUM ABDOMINELLEN KAISERSCHNITT. Von Geheimrat Professor Dr. Georg Winter in Koenigsberg. Verlag von Ferdinand Enke, Stuttgart, 1931.

DIE HORMONALE STERILISIERUNG DES WEIBLICHEN ORGANISMUS. Von Professor Dr. Ludwig Haberlandt. Mit 6 Abbildungen im Text. Verlag von Gustav Fischer, Jena, 1931.

BECKENVERBINDUNGEN DES MENSCHEN mit besonderer Beruecksichtigung von Schwangerschaft, Geburt und ihren Folgen. Von Dr. Walter Putschar. Mit 66 Abbildungen und 9 Tabellen. Verlag von Gustav Fischer, Jena, 1931.

MUTTERSCHAFTS-FUERSORGE. Von Dr. Max Hirsch, Berlin. Verlag von Curt Kabitzsch, Leipzig, 1931.

ERGEBNISSE DER MEDIZINISCHEN STRAHLENFORSCHUNG. Herausgegeben von H. Holfelder, etc. etc. Band V. Mit 396 Abbildungen im Text. Verlag von Georg Thieme, Leipzig, 1931.

HANDBUCH DER INNEREN SEKRETION. Herausgegeben von Dr. Max Hirsch. II. Band, Lieferung 9. Altern und Verjuengung von Professor Dr. Romeis. Verlag von Curt Kabitzsch, Leipzig, 1931.

LEHRBUCH DER GYNAEKOLOGIE. Von Professor Dr. W. Stoeckel in Berlin. Dritte, neubearbeitete Auflage, mit 466 Abbildungen und 65 farbigen Tafeln. Verlag von S. Hirzel, Leipzig, 1931.

DIFFERENTIAL DIAGNOSTIK IN DER PAEDIATRIE. Von Dr. Walter Pfueger in Stuttgart. Verlag von Theodor Steinkopff in Leipzig, 1931.

PRATIQUE OPÉRATOIRE DES ANNEXES DE L'UTÉRUS. Par Raoul Charles-Monod. Avec 87 figures dans la texte. Editeurs, G. Doin et Cie Paris, 1931.

TROUBLES FONCTIONNELS DE L'APPAREIL GÉNITAL DE LA FEMME. Par professeur Gaston Cotte de Lyon. Deuxième édition, revue, corrigée et augmentée. Editeurs, Masson et Cie, Paris, 1931.

THE CHEST IN CHILDREN. By E. Gordon Stolloff, Mount Sinai Hospital in New York. Publishers, Paul B. Hoeber, Inc. New York, 1931.

Corrections

In the July issue, page 64, the article by Melvin A. Roblee, "Treatment of Cervicitis by Caution and Electrocoagulation," the author's degrees should read B.S., M.D., instead of B.S., M.S.

In the May, 1931, issue, page 644, in the article by A. W. Rowe, "Some Functional Criteria of Normal Pregnancy," in Table III, under the group "Gain Per Week" the figure under column "C" should read, 0.54; and the figure under column "Average" should read, 0.46.

American Journal of Obstetrics and Gynecology

VOL. XXII

ST. LOUIS, SEPTEMBER, 1931

No. 3

Original Communications

THE UNIFICATION OF SCIENCE AND ITS RELATION TO THE CONTROL OF LIFE*

BY WILLIAM P. GRAVES, M.D., BOSTON, MASS.

THE ultimate goal of pure science is the complete unification of all the laws of nature into a single principle which shall explain the phenomena both of living and nonliving matter. The goal of applied science is to utilize the knowledge thus gained in ways that may benefit the human race. The purpose of this paper is, first to sketch briefly the more important steps by which pure science has reached its present stage on the road toward unification; second, to show how the new knowledge of physics and chemistry is being applied to the study and control of life processes; and third, to draw certain conclusions relative to the conduct of medical education and practice.

THE DEVELOPMENT OF NATURAL SCIENCE

To the Greeks, chiefly, we owe the beginnings of natural science, for they were the first of primitive people to recognize that the mysteries of nature are directed not by gods and demons, but by definite discoverable laws. Though, in comparison with their priceless contributions to art and literature, they added little of permanence to practical science, their deductive method of reasoning led them to many conclusions of amazing accuracy. Thus they described the rotation of the earth and the solar system, and explained the cycle of the seasons. They even calculated the earth's circumference and predicted an eclipse of the sun in 500 B.C. In the first attempts to reduce nature to its simplest terms, Democritus conceived the atomic theory

*Presidential Address, presented at the Fifty-Sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 19, 1931.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

and Heraclitus described the eternal flux of matter, both in harmony with modern empirical knowledge. While Thales expressed a belief in the essential unity of nature in 600 B.C.

But the Greeks were ignorant of the experimental method and their wonderful deductions were sterile and soon forgotten. Some of their speculations actually hindered the progress of scientific thought. Aristotle, accepted for centuries as the arbiter of science, obscured the knowledge of physics to the time of Galileo by his unaccountable blunders regarding physical laws. Plato's dual philosophy of spirit and matter, beautiful though it was, sowed the seeds of that religious intolerance which completely obstructed science through the Middle Ages and hampered it until recent times.

The inspiring theory of the unity of nature, proclaimed by the great philosophers of the Greek period, was later developed by the famous Roman poet Lucretius in his poem "*De Rerum Naturae*." But his unitarian ideas were soon displaced by the Christian dogmas, and until the present century he has been generally regarded as the unholyest of all pagan philosophers.

Modern physical science was born early in the seventeenth century when Galileo established the experimental method as the basis of determining natural laws. His invention of the telescope made possible the discoveries of Newton, Kepler and Laplace in the following generation, by which the laws of mass, inertia, motion, and gravitation were correlated for the entire universe and supposedly fixed for all time. The estimation of the velocity of light by Roemer and the conception by Huyghens of a luminiferous ether paved the way for many of the triumphs of the nineteenth and twentieth centuries.

The discoveries in the field of electricity constituted the greatest step of all toward a solution of the unity of nature, for thereby was revealed the force which present-day science has proved to be the basic principle of all matter whatsoever.

The nineteenth century abounded in examples of scientific unification. Heat, long supposed to be a separate entity and called "caloric" or "phlogiston" was shown to be a form of energy, which in turn was proved to be an inseparable property of mass. These discoveries led to the great Law of the Conservation of Energy, called by modern scientists the most far-reaching physical principle ever developed. During the brilliant succession of Oersted, Faraday, Maxwell and Hertz, electricity and magnetism were discovered to be interconvertible phases of an identical force, and the same force, electro-magnetism, was identified with the phenomena of light.

Chemistry, the belated offspring of the chaotic alchemy of the Middle Ages, came into its own in the nineteenth century. The discovery of the Periodic Law of the elements and the revelation of new

elements by the spectroscope established the structural unity of the universe. The experiment of Wöhler in 1828 by which he succeeded in synthesizing urea, a product of living matter, broke down the old distinction between organic and inorganic chemistry based on the presence or absence of life and prepared the way for a fusion of the two into a single science.

Toward the close of the nineteenth century the exciting events of new discovery and correlation had come to an end and it was generally believed that the knowledge of natural science was well-nigh complete. It was at this moment of fading enthusiasm that the discoveries of the x-rays and radioactivity revealed the subatomic nature of matter, and a new era was ushered in, which has advanced science a long way toward its unitarian goal.

It would be audacious of me to attempt to expound the present rapidly changing theories of natural science, many of which can be understood only by specially trained minds. But there are certain new concepts, already familiar to you, which must be mentioned in order to complete my thesis of the convergent trend of science.

The ultimate atom of Democritus and Lucretius was shown by Dalton to be not an atom at all in the literal sense but a complicated molecule made up of smaller and supposedly indivisible particles combined in numerical proportions. Nearly a century later radioactivity proved Dalton's atom to be complex and to consist of a positively charged nucleus, or proton, surrounded by negatively charged electrons, the number of which determines the physical properties of the element. In the great search for the ultimate, the electron is at the present moment the last word of indivisibility—but even on this, doubt has already been cast.

The century-old theory of Prout that the hydrogen atom is the building-block unit from which all other elements are constructed has been recently proved beyond contention. Thus the dream of the alchemist of a primeval element has at last been realized.

The greatest achievement of the nineteenth century had been the correlation of all natural forces into the two separate concepts of mass and energy. Probably the greatest event of the twentieth century has been the identification of mass and energy, mathematically proved by Einstein in 1907. Matter is thus shown to be a collection of electrical charges. Hence, as Jeans puts it, "All the sciences which deal with the properties and structure of matter, have with one turn of the kaleidoscope become ramifications of the single science of electricity."

Einstein has further identified inertia and gravitation and hopes eventually to link them with electro-magnetism. The theory of relativity has led to the fusion of space and time as a single inseparable concept. Furthermore, mass has been described as a crumpled in-

equality of space and time. Space is asserted to be finite and is being measured by a new non-Euclidian geometry that requires a fourth dimension. Geometry is being fused with physics. Eddington says, "An ideal shines in front of us, far ahead perhaps but irresistible, that the whole of our knowledge of the physical world may be unified into a single science which will perhaps be expressed in terms of geometrical or quasi-geometrical conceptions." And again the same author makes this pregnant statement: "There is no reason to regard the partitions of the sciences made in the early stages of human thought as irremovable."

Many of the new discoveries may be understood without any serious change in the routine processes of thought. But the relativity and quantum concepts require an intellectual reversal similar to that produced by the announcements of Copernicus and Darwin.

The theory of relativity, excepting in its elementary phases, reaches beyond the mental scope of the ordinary individual, unaccustomed to think in terms of the higher mathematics, so that many of its deductions seem puzzling and even paradoxical. But the quantum theory is more comprehensible and touches the thinking man in an intimate way. I shall therefore pause to consider it, as it has a certain indirect bearing on the argument of this discourse.

The quantum theory, originated by Planck and mathematically proved by Bohr and Einstein and others, asserts the *discontinuous* or *granular* nature of energy; that is to say, energy does not flow in a continuous stream but is emitted in a series of jumps or quanta, the stimulus of each one of which, is a chance atomic disturbance. In stable matter the discharge results from the influence of some external force. In radioactive substances it is due to the chance spontaneous decay of individual atoms. I shall not attempt to discuss the immense importance which the quantum theory is having in solving the problems of the new science of wave-mechanics. I shall speak only of its relation to a philosophical problem which has troubled the mind of man since time immemorial. If the element of chance enters into nature's most fundamental function, i.e., the transmission of energy, it is evident that the doctrine of a mechanistic world, predetermined and inexorable, is shattered, and with it the argument, hitherto unanswerable, against the freedom of the will. Kant in his philosophy included freedom with God and immortality as the three central mysteries of the supersensual world, knowable but not provable. The quantum theory permits us to take freedom from the realm of mystery, and correlate it with the proved laws of physics, an important step toward the monism of physics and psychology that has long been predicted.

Finally, it must be noted that physics and chemistry are rapidly losing their dividing line and must eventually be fused into a single

science. They are now merely chapters of a single book to which other chapters will be added as the various branches of science become simplified and blended in terms of a common principle.

THE CONTROL OF LIFE

When one contemplates the achievements of the great masters of pure science and the prodigious mechanical triumphs of applied science, the thought at once occurs, why have not similar results been attained in the realm of living matter? The question is especially pertinent to us whose daily task is a combat against the natural enemies of life, in which we are only too often the losers. Our next inquiry, therefore, relates to what is known of that special property of matter which we call life, and to what part applied science is playing in its control.

And first we must ask, what is life? It is evident that life, as we know it on this globe, is an extraordinary event in the evolution of the universe. It is possible, and some think even probable, that life, at least in its highest manifestation of reasoning human beings, exists at the present time only on the astronomical speck of matter which we call the earth. Speculation as to the purpose of life is well summed up by Sir James Jeans, who asks "whether it is a final climax toward which the creation moves. Or is it a mere, and possibly quite unimportant, by-product of natural processes, with some other stupendous end in view? Or is it of the nature of a disease which affects nature in its old age? Or is it the only reality which creates, instead of being created by, the colossal masses of the stars and nebulae, and the almost inconceivably long vistas of astronomical time?"

But to us as physicians speculation as to the purpose of life is of minor importance. We are concerned with the grim facts of life, and with devising means to combat certain physical ills that beset it from its beginning to its end.

The modern scientist no longer ascribes to living matter a mysterious and inscrutable "vital principle" which for a time pervades or is imposed upon matter. He assumes, on the contrary, that life is a natural phenomenon that obeys the physical laws prevailing elsewhere in the universe. Jeans regards life as a property of matter analogous to magnetism and radioactivity. Just as magnetism is determined by the number of planetary electrons of iron, and radioactivity by the subatomic structure of decaying uranium, so life is dependent upon the individual electronic make-up of the carbon atom. The scientist makes no pretense of explaining the ultimate nature of life any more than he does that of magnetism and radioactivity or of electricity, but he reasons that life, like the other forces of nature, is a convertible form of energy which he hopes finally to command for the everlasting benefit of mankind. That he has not already done so is due to the immense

complexity of the molecule of living matter, which is so intricate and subject to such constant variation that it has so far defied analysis.

It is sufficiently evident that the vital processes of living organisms represent chemical transformations of matter from birth to death. Conception itself is a chemical reaction, as has been proved by the biologists, who by chemically treating the unfertilized eggs of sea urchins and frogs are able not only to repeat early cell-division but to carry the organisms through the complex stages of growth to maturity. The human body is a vast chemical laboratory on which depend the functions of digestion, respiration, secretion, elimination, muscular action, the emotions, and probably conscious thought itself. Death is an overwhelming chemical change in the colloidal substance of the body. Diseases that are not of a purely mechanical nature are all the result of chemical changes. Infectious diseases result from the toxic growth of parasitic organisms. Functional diseases are due to deficiency or overproduction of natural secretions by which the delicate balance of the body-chemistry is upset. Cancer is the reaction of living cells to long-continued chemical irritation; and so on to the end of the list.

The concept of life in all its aspects as a series of chemical reactions is, of course, not new, but it has been enormously developed by the newly acquired knowledge of physical chemistry. It is therefore proper to designate the present as the Chemical Age of medicine, since it can be shown that all branches of medical science are, in their progressive aspects, tending toward a common physicochemical goal.

Man has always, knowingly or unknowingly, looked to chemistry for a cure of his physical ills. The herbs of primitive people occasionally hit the scientific mark, as in the case of cinchona. The murderous alchemy of the Middle Ages resulted from a frenzied search in nature's store for the great panacea. In premodern days there was an immense pharmacopeia, feeble for the most part and containing only two or three specific drugs that had been discovered by accident. Then Lister introduced the principle of antisepsis and Pasteur founded the far-reaching science of immunology. In more recent times chemistry, aided by the new laws of physics, has had many triumphs. Synthetic chemistry has given us such remedies as Ehrlich's 606 and the products of coal tar. Physiologic chemistry has given us the liver cure for pernicious anemia, one of the most astonishing of all specific remedies.

To chemistry and physiology we owe not only the isolation of many of the internal secretions of the body, but the actual synthesis of some of them, whereby the therapeutic value of the natural extract is exceeded. In this way the whole science of endocrinology, for a time looked upon askance by the general profession, is now on a solid experimental basis and offers a boundless field for future research.

Another chemical triumph is the discovery of the vitamins, a new field that promises to have an immense influence in regulating the health of the race. At the present time the subject is largely veiled in mystery. Most significant is the production of vitamin D by ultra-violet irradiation, a striking illustration of the convergence of physics and chemistry. Sperti, in a recent work, applied the quantum theory of radiation to a study of vitamin D and obtained a product of new potency by a proper selection of the wave-lengths of light.

The foregoing are only a representative few of innumerable instances in which the laws of chemistry and physics are being employed in the general treatment of disease.

But let us carry the matter further and inquire how certain of the special branches of medicine stand in relation to the basic sciences.

Anatomy reached its peak many years ago and with the advent of the microscope evolved into histology and embryology. Embryology matured in turn and has now become, in its progressive phase, an experimental science closely associated with biology and genetics. Its remarkable achievements in transforming life at its source are based on chemical changes.

Histologic pathology, fathered by Virchow and developed for half a century by able investigators, has well-nigh exhausted its original morphologic field and is now turning to the study of cell-function. Bacteriology is reaching the limit of microscopic research and is now chiefly concerned with the biochemistry of immunology. Genetics, the youngest of the biological sciences, is not yet generally included in medical curricula, but it promises some time to occupy a position of supreme importance. Based on immutable natural laws and speeded up by modern methods of research, genetics has in the short space of thirty years attained the distinction of an exact science. It has accurately "analyzed the phenomena of heredity and development in terms of matter." Its industrial application now governs plant culture and the breeding of domestic animals. It has added much to the knowledge of constitutional diseases, especially that of cancer. And, finally, it has demonstrated in a dramatic way possibilities in the mastery of life that tax the most vivid imagination.

The geneticist has traced the source of heredity characters to the complicated molecule of the genes of the chromosomes. And here he also stops and is calling on physical chemistry to solve the problems of future progress by unlocking the tiny chamber that conceals the most mysterious of all the secrets of life.

The subject of Radiant Energy is perhaps the most important field of all human research at the present time, covering as it does a study of the entire universe from the limits of space to the smallest unit of subatomic matter. Nor is it of interest only to the great men of pure

science, for it promises to have a most intimate bearing on human welfare. The dependence of life-nourishment on the radiance of the sun has long been understood. The physiologic effects of ultraviolet light have been revealed and put to beneficent use. X-radiation and the radioactivity of metals are now an incalculable boon to medicine in diagnosis and the treatment of disease. And yet all this is probably the merest beginning.

The cosmic rays, which but a short time ago seemed an extravagant myth, are already a comprehensible reality. Having their source in the vast interstellar spaces beyond the nebulae of the Milky Way, and independent of the sun, these rays are of such incredible hardness (their frequency is one hundred million times that of visible light) that they can penetrate eighteen feet of lead, two hundred feet of water, and seven hundred feet of earth. Here is a newly discovered force of nature which man will eventually harness and utilize. Already speculation is rife as to the part these rays may play in the chemistry of life and death, a problem which must be solved by the men of science.

To us, as gynecologists and obstetricians, the status of surgery in the present reformation of medical science is of particular interest. Surgery has always been in many ways a detached branch of medicine. It is obviously not a science in the strict sense of the word. Some have attempted to include it among the fine arts, but such a notion requires too great a stretch of the imagination. Operative surgery is essentially a craft, requiring for its routine performance no high degree of technical talent nor great intellectual endowment; hence the early surgeon occupied a somewhat lowly position among the medical fraternity. But the advent of anesthesia and antisepsis raised surgery to a noble calling which rapidly acquired an incomparable power of saving and prolonging life. During the period of technical exploration the surgeon of daring ingenuity held the center of the medical stage. But that period is waning. Lord Moynihan, in a recent address, emphasized that surgery is reaching the limits of technical possibilities and is now turning for progress to the study of function. The same idea has been expressed by Ward, Mayo, Whitridge Williams, and others. Modern operative surgery, therefore, is also becoming a servant of science. Its present eminence was created by the sciences of chemistry and bacteriology and on science it will depend for its future progress.

CONCLUSIONS

The great advance of science and its rapid application in the form of mechanical invention has filled many timid souls with dismay. Some think that man has created a sort of Frankenstein that will one day turn and destroy him. Some, like Oswald Spengler, discern in the

Machine Age a decadence of civilization. The New Humanist cult see in it a devastating materialism that is ruining culture, and they urge a return to classical standards of thought and living.

Most people, however, believe that the Machine Age is raising humanity to a higher level of physical and cultural existence, while the medical profession sees in it a supreme opportunity for bettering the health and quality of the race.

The unification of the sciences means their simplification, and there is no doubt that in the more or less distant future a real knowledge of science will be the common heritage of all educated people. In the meantime, for the medical man above all, education in basic science including mathematics is becoming more and more imperative—one that must be early, thorough, and broadly comprehensive. And to theoretic knowledge must be added training in experimental research.

But no plea is necessary for a scientific reformation of medicine, for that movement began with Lister and Pasteur and is now pursuing an irresistible course. The same unification which we have seen apparent in all phases of science is taking place in medical education and practice. The old partition between the clinic and the laboratory has been completely removed. The old antagonism between clinician and laboratory man is dying and the two, though not yet entirely unified, are at least mutually coordinated. And in this union the laboratory worker has the upper hand, for where the great clinician cures his thousands the great researcher cures his tens of thousands. If the young clinician resents this situation, the only answer must be, "Become, then, a researcher yourself." It is a fallacy to think that the successful investigator must be born, not made. The same was once said of surgeons. And it is precisely this combination in the same individual, of science and practice, that is more and more being demanded in the clinical appointments of hospitals and medical schools.

The present problems of the vanishing family doctor and the flourishing specialist that are vexing the public will in time be solved by a multiplication of hospitals and clinical groups, properly spaced and manned by experts; an inevitable outcome of the public demand for the best medical service—a demand in which the poor are even more insistent than the rich.

And attached to these medical centers must be laboratories; not those of the old-fashioned kitchenette type, but big laboratories, teeming with busy young men; both those who are devoting their lives to research and those who are preparing themselves for the up-to-date practice of medicine or surgery.

If this sounds too idealistic, listen to the famous message of the great Pasteur, who said: "Take interest, I implore you, in those sacred dwellings which one designates by the expressive term: Laboratories.

Demand that they be multiplied, that they be adorned; these are the temples of well-being and of happiness. There it is that humanity grows greater, stronger, better," for, as he says elsewhere, "Science is the soul of prosperity of nations and the living source of all progress."

REFERENCES

Abbott: Flatland, 1929, Little, Brown & Co. *Bent*: Machine-Made Man, 1930, Farrar and Rhinehart. *Berthoud*: The New Theories of Matter and the Atom, 1924, Macmillan. The Chemical Foundation: Chemistry in Medicine, 1929. The Chemical Foundation: The Future Independence and Progress of American Medicine. *Darrow*: The New World of Physical Discovery, 1930, Bobbs-Merrill. *Dar-row*: The Study of Chemistry, 1930, Bobbs-Merrill. *Eddington*: The Nature of the Physical World, 1930, Macmillan. *Eddington*: Space, Time and Gravitation, 1929, Cambridge University Press. *Gaskell*: What Is Life? 1928, Chicago University Press. *Haeckel*: The Riddle of the Universe, 1900, Harpers. *Haeckel*: The Wonders of Life, 1905, Harpers. *Hamilton*: The Greek Way, 1930, W. W. Norton & Co. *Heyl*: The Frontiers of Physics, 1930, D. Appleton & Co. *Heyl*: The Fundamental Concepts of Physics in the Light of Modern Discovery, 1926, Williams & Wilkins. *Jeanes*: The Mysterious Universe, 1930, Macmillan. *Jeanes*: The Universe Around Us, 1929, Macmillan. *Koppányi*: The Conquest of Life, 1930, Appleton. *Lull*: The Ways of Life, 1925, Harpers. *MacKay*: The Dynamic Universe, 1931, Scribner. *Morgan*: Experimental Embryology, 1927. *Pupin*: The New Reformation, 1927, Scribner. *Russell*: The A B C of Relativity, 1925, Harpers. *Slosson*: Easy Lessons in Einstein, 1920, Harcourt Brace & Co. *Spengler*: The Decline of the West, 1926, Knopf.

Tarlo, B. S., and Olerskaja, N. N.: Determination of the Chloride in Perspiration in Connection with the Total Body Saline Content. Zentralbl. f. Gynäk. 54: 797, 1930.

The authors believe that one must consider the chloride content of the perspiration, as well as that of the blood and urine, when studying patho-physiologic changes in the body during pregnancy. They feel also, that the skin plays an important rôle in the total salt excretion of the body. Consequently, they undertook to make estimations of the chloride content of the blood, urine, and perspiration, paying particular attention to the latter, during normal and toxemic pregnancies. Method: An electric light bath was used. The skin area to be tested was cleansed with distilled water and then dried. Filter paper was used to take up perspiration. Sweat droplets were blotted, care being taken to see that the paper did not touch the skin. The paper was weighed carefully before and after blotting, and the chloride was estimated by titrating against silver nitrate solution. Bang's micro method was used for blood, and urine was tested by Mohr's technic. The average chloride content of perspiration during the first half of pregnancy was 485 mg. per cent. In general it was found that the values fell with the duration of pregnancy, until during the latter part of gestation the values were about 367 mg. per cent. The lowest values were found in the toxemias of pregnancy, when the chloride content of perspiration reached the low levels of 261 mg. per cent. The curve for urine paralleled that of perspiration. However, the curve for blood did not fall as the pregnancy progressed, but remained elevated, both in the latter part of pregnancy, and in toxemias.

WILLIAM F. MENGERT.

GUM ACACIA IN THE TREATMENT OF ECLAMPSIA

A PRELIMINARY REPORT

BY WILLIAM J. DIECKMANN, B.S., M.D., ST. LOUIS, MO.

(From the Department of Obstetrics and Gynecology, Washington University School of Medicine and the St. Louis Maternity Hospital)

A CONCENTRATION of the blood is in our experience the most consistent finding in eclampsia and the object of our treatment has been primarily to relieve this condition. I have not been able to find published reports of any conclusive work which deals with this problem. Stander, basing his opinion on blood moisture determinations, states that there is no concentration but if anything a hydremia. We have accumulated sufficient evidence based on blood volume, hemoglobin, cell volume, and serum protein determinations to prove that in eclampsia there is either an absolute or a relative decrease in blood volume. If the hemoglobin, cell volume, and serum protein percentage are greater than normal, the decrease in blood volume is absolute; but if these constituents are higher than the average for that particular period of pregnancy, the decrease in volume is only relative. In either case the magnitude of change in blood volume may be from 500 to 1,500 c.c. These figures are arrived at by determining the blood volume and then calculated daily changes are based on the percentage of increase or decrease of hemoglobin, cell volume, and serum protein. We have a number of determinations in patients with pre-eclampsia who developed eclampsia and showed this concentration.

Many chemical changes in the blood in eclampsia have been pointed out by numerous investigators but they may be secondary to the concentration. In a concentrated blood because of the increase in cell volume and serum protein, the viscosity is increased and as a result the blood flow through tissues and organs is diminished. Due to the faulty circulation a tissue acidosis is produced and waste products also accumulate in the blood because of decreased volume flow through the kidney. Stander and others have shown that the convulsions (muscular exercise) and anoxemia produce a severe acidosis, due to the accumulation of organic acids, which normally lasts only a few minutes, but if these substances are not removed either by oxidation or excretion by the kidneys or lungs, death may occur. The concentrated blood also has a very short clotting time which predisposes to intravascular thrombosis and undoubtedly plays a part in producing the pathologic lesions found postmortem. Thus we have a classical example of a vicious circle; but, if it can be broken early before there

are marked pathologic changes, there is no reason why the patient should not be cured.

For the past four years we have accumulated both chemical and physical data from the blood of patients suffering from toxemia of pregnancy; and for the past year we have been determining blood volume and also certain physical characteristics of the blood in normal pregnancy. Our purpose is to have a set of normal figures; for, although much of this work has been done previously, its value is questionable either because of imperfect technic in analysis or because of improper methods of obtaining the blood. Furthermore, we believe that the normal changes of pregnancy can only be determined satisfactorily by following a number of women from early pregnancy to the late puerperium.

It is generally accepted that in normal pregnancy there is a true hydremia and that in preeclampsia this hydremia is even more marked. Our studies show that in eclampsia the hemoglobin, cell volume, and serum protein percentage approach or are greater than those of normal pregnancy. This concentration is similar to that seen in shock, intestinal obstruction and severe burns, although the figures may not be so high, and requires similar treatment, namely a procedure which will replace water in the circulation and keep it there.

The most important part of our treatment has been the injection of glucose solution intravenously, and in a previous report we were able to show that in many cases, following such an injection, the dilution or hydration would persist, and usually the patient improved clinically. However, we found that in certain cases, the dilution could not be maintained and in these we advocated delivery preferably from below, but in certain cases cesarean section under local anesthesia. General anesthetics were definitely contraindicated, because they produced changes similar to those found in eclampsia, as shown by Stauder's work.

In the past year we have had several patients in whom we could not dilute the blood even after delivery. During and for a short time after the glucose injection there would be a dilution but several hours later, the blood would again be concentrated. Injection of large amounts of glucose over periods of three to seven hours and in one case an additional plasmapheresis were without effect. The explanation, we believe, is that the serum proteins were changed in some way so that they would not hold water. A blood transfusion would not be advisable because of the already high hemoglobin, cell volume, and viscosity. It occurred to us that gum acacia would be an ideal solution to increase the blood volume, because, due to its colloidal properties, it would remain in the circulation, and would hold water. The result would be an increase in blood volume and a decrease in the

viscosity, thereby causing an improvement of the circulation to tissues and organs. These properties had been made use of by Czerny, Erlanger and Gasser, and others in their treatment of shock. We used the gum acacia prepared by Eli Lilly and Company for the treatment of shock.

M. T. (8464) was the first eclamptic patient in whom it was tried as a last resort after all other treatment including plasmapheresis had failed to produce a satisfactory diuresis, dilute the blood or relieve the toxemia as manifested by coma, temperature, etc. Essential data are summarized in Table I. The marked clinical improvement was closely associated with the blood dilution.

E. R. (9601) likewise did not respond satisfactorily to glucose therapy and delivery; and had also been placed on the critical list,

TABLE I.* M. T. No. 8464

DATE	TREATMENT	URINE C.C.	CLINICAL CONDITION T.P.R.	HR. PER CENT	CELL VOL. PER CENT	SERUM PROT. PER CENT	CO ₂ VOL. PER CENT	P _H
1930								
6/11	4 P.M. 1000 c.c. 20% Gl. 200 M.		37.5-140-16 Coma	95	42	7.2	37	7.47
	1 A.M. 1000 c.c. 20% Gl.		Convulsions VI					
Total	2200	2300						
6/12	9 A.M. 1000 c.c. 20% Gl. 500 c.c. 10% Gl.		39.6-140-36 Coma	111	45	7.4	30	7.47
	2 P.M. 2600 c.c. 10% Gl. in 3 hr.							
	7 P.M. Plasmapheresis	800 c.c.	Plasma- { Before pheresis { After	105 95	44 42	6.8 6.7	46 41	
	4300 c.c. N.T.							
Total	8900	1550						
6/13	9 A.M. 600 c.c. 30% Gl.	26 c.c. in 15 hr.	38.7-172-40 Coma	105	45	6.6	45	7.5
	5 P.M. 500 c.c. 6% Gum Acacia							
	500 c.c. 20% Gl.		2 P.M. Stimulants					
	11 P.M. 1000 c.c. 20% Gl.		11 P.M.	83	36	4.5	42	
	1000 c.c. N.T.							
Total	3600	450+ in 9 hr.	10 P.M. Recognizes Husband					
6/14	500 c.c. 20% Gl. 1900 c.c. N.T.		38.7-132-36 Improved Conscious	83	35	5.8	44	
Total	2400	450+						
6/15	1000 c.c. R. 1400 c.c. N.T.	125+	37.8-108-22 Conscious					
6/16	3400 c.c. M.	850+	Drowsy 37.6-100-24					
6/17	3400 c.c. M.	1000+	Hungry 37.6-88-24 Uneventful Recovery					
6/18	3600 c.c. M.	1200+	38.3-110-24					
6/21	2700 c.c. M.	950+	37-90-20	77	32	6.3	43	

*Gl., Intravenous Glucose. M., Fluids by Mouth. N. T., Nasal Tube.
T. P. R., Temperature, pulse, respirations.

but after a second injection of acacia, the glucose solution worked satisfactorily and produced a tremendous diuresis coincident with a blood dilution and clinical improvement of the patient. Table II contains data accumulated on this case. There was a decided increase in chloride excretion following the acacia. The serum albumin was also below normal.

Table III illustrates the effect of acacia solution in a severe pre-eclamptic patient. A marked dilution and increase in chloride excretion can be noted. The effect clinically was almost magical, for within six hours all of the symptoms had disappeared and the patient was relieved for approximately forty-eight hours. Her condition clinically and also the marked blood concentration on admission which was not relieved by glucose solution warranted immediate delivery, but the marked improvement after the acacia tempted us to wait. Her symptoms returned with increased severity and although she was delivered, death occurred thirty minutes after delivery. There was no coma or convulsion, but at autopsy the liver showed the hepatic lesion of eclampsia. Because of its rarity, this case will be reported separately.

M. W. (19540) developed postpartum eclampsia, having 19 convulsions in forty-five hours. After she had been in coma for fifty-one hours and was considered moribund, 200 c.c. of the 30 per cent gum acacia solution were added to 800 c.c. of 10 per cent glucose and in-

TABLE III. I. M. No. 10559

DATE	TREATMENT	URINE		T. P. R. CLINICAL CONDITION BLOOD PRESSURE	CELL SERUM		CO ₂ VOL. PER CENT	P _H
		VOL. C.C.	NaCl GM.		HB. PER CENT	VOL- UME PER CENT	PRO- TEIN PER CENT	
1931								
2/6	1000 c.c. 20% Gl. 1200 c.c. M.			37-96-20 Headache Drowsy 180/135	125	50	5.8 49	7.47
Total	2200	1400	0.9					
2/7	1000 c.c. 6% Acacia noon 2700 c.c. M. and diet			36.5-82-18 Headache Drowsy 180/135 6 P.M. Improved	125	50	6.3 5.7 45	7.4
Total	3700	2700	3.0					
2/8	2900 M. and diet	2200	2.6	36.7-88-20 Feels fine 180/135	111	39	4.2 45	
2/9	3000 M.	2000	0.6	36.5-88-20 Nausea and vomiting Epistaxis 180/135	105	40	4.1 47	7.45
2/10	500 c.c. 6% Acacia 500 c.c. 20% Gl. Bag induction Delivered			36.5-90-18 Headache 195/160 Died	118	47	5.4 46	7.4

jected. Approximately seven hours later the patient was conscious and able to respond to questions. No studies were made, but because of the marked improvement in a few hours, it seems reasonable to ascribe it to the acacia solution.

In the literature I have been able to find only two references to the use of gum acacia solution in conditions other than shock. Rogers in 1919 stated that after its use in Asiatic cholera, the patient was worse and that death occurred in several moderately severe cases, which would probably have recovered with hypertonic saline solution.

Keith and Walker state that since gum acacia solution is extremely valuable in shock because it restores the blood volume, it should be of value in the treatment of decreased blood volume or dehydration. They felt that Roger's poor results were due to the fact that water was extracted by the acacia from already dehydrated tissues. They injected 80 c.c. per kilo of a 6 per cent acacia solution into normal dogs and into dogs which had been dehydrated by the injection of 50 per cent suerose solution which was injected over a period of two hours at the rate of 7 gm. per hour for each kilogram of body weight. The hemoglobin at the beginning of the experiment was considered 100 and the average concentration after dehydration was 127 per cent.

In the normal dog they report that the perecentage of hemoglobin and hematocrit value of the erythrocytes consistently decreased during an injection of acaeia, indicating an increased volume of blood. These values did not return to the initial figures in less than three days. The volume of urine was increased.

In the dehydrated animals, injection of 0.8 per cent NaCl solution caused a rapid return to normal blood volume. However, if they then injected acacia solution, there was a blood dilution which lasted for several hours. If they gave the acacia solution first and then the salt, the dilution persisted for several days. In normal animals and also in those suffering from hemorrhage the tolerance for acaeia is approximately 4.8 gm. per kilogram, but in the dehydrated animal the tolerance is much less and death will occur if too much is used. The output of urine after an injection of acaeia was always larger than the amount of fluid injected and was also greater than similar amounts of salt or glucose would produce.

/ Gum acacia in water produces a colloidal suspension, having an osmotic pressure or a water absorbing power and a viscosity, both of which will vary with its concentration. Because the acacia forms a colloidal suspension, it will remain in the circulation for a period of days, will absorb and hold the water. Due to its osmotic pressure, the serum protein percentage will decrease presumably proportionately. Table IV contains data from a patient with nephritis in pregnancy. The dilution was less and the return to normal quicker than in the three eclamptic patients. However, although the volume of urine was not particularly increased, the chloride excretion was more than doubled. This latter property is extremely important because by a judicious use of acacia and glucose solution, which we have demonstrated also causes increased chloride excretion, we should be able to not only reduce the marked edema found so frequently in pregnancy toxemias, but be able to reduce the brain volume and thereby not only

decrease the likelihood of convulsions, but either clear up coma and hyperthermia or prevent their appearance.

TABLE IV. G. R. No. 9501

DATE	INTAKE	URINE		HEMO- GLOBIN PER CENT	CELL VOLUME PER CENT	SERUM PROTEIN PER CENT
		VOL. C.C.	GM. NaCl			
12/4	3460	3400	5.1			
5	*2100	2950	12.5	111	40	5.4
6	*2790	3200	10.2	111	40	5.0
7	2650	2750	7.3	105	38	4.5
8	3035	2600	6.5			
9	2925	2100	7.2			
10	3385	925	3.1	125	44	5.7
11	3800	1475	1.1			

*500 c.c. 6 per cent acacia solution.

In eclampsia there is a marked shift of the albumin globulin ratio from the normal of 1.2 to 2.0 to one or less. Since the osmotic pressure of serum albumin is almost four times that of the globulin, it is evident that the osmotic pressure of the serum will presumably be decreased. Many investigators have presented data showing that in certain cases the edema is due to low serum proteins; but in eclampsia with edema we find the height of the diuresis is at the time when the protein concentration is lowest. Undoubtedly other factors are involved. Hartmann has shown clinically that acacia solution will raise the osmotic pressure of a serum low in protein, especially albumin. This is not the only action of the acacia for we have data demonstrating that in addition there are changes in the serum and serum electrolytes as shown by marked differences in surface tension and conductivity.

I hesitate to add anything more to the already varied treatment of eclampsia, but our results were so striking in cases in which heretofore used methods had failed, that we believe it should be given a general trial. We suggest using 500 to 1000 c.c. of a 6 per cent gum acacia solution. Much larger amounts have been given in shock, but the decrease in serum proteins in eclampsia is much more marked than would occur in shock and we do not know how low they can be artificially forced with safety. We have also noted that normally as the proteins decrease, fibrin tends to increase, but following acacia, this apparently is not true. Therefore, it is possible that the fibrin could be decreased to such a degree that either the blood would not clot or if it did, the clot would not be a firm one.

CONCLUSIONS

The principal change in the blood in eclampsia is a concentration, which may be absolute or relative. Relief of this condition is usually accompanied by clinical improvement.

Hypertonic glucose solution injected intravenously has given the best results in relieving this condition.

Gum acacia solution has cured patients who did not respond satisfactorily to our usual methods of treatment. The probable explanation is that an injection of acacia solution increases the blood volume, lowers the viscosity, and thereby improves the circulation through tissues and organs.

PROTOCOLS

CASE 1.—M. T. (8464) was admitted on June 11, 1930, because of post-partum convulsions. Pregnancy had been uneventful. The patient was delivered of twins nine hours previous to admission. Two hours after delivery she began having convulsions. Out-patient intern sent patient into hospital. Examination: Patient was in coma. Temperature 37.8, pulse 140?, respirations 16. Blood pressure 150/90. Tongue was markedly swollen and protruding from mouth. No edema. Urine showed trace of albumin. Treatment was intramuscular $MgSO_4$, intravenous glucose, colonic irrigation, and 10 per cent Karo syrup solution through nasal tube. She had 6 convulsions after admission, and twenty-four hours after admission because of inability to maintain a blood dilution with intravenous glucose solution, a plasmapheresis was done. No particular effect was noted. Patient was in coma throughout this time. The temperature had increased to 39.5°, pulse varied from 130 to 172, and the respirations had increased to 36-48. Since the urine secretion was very poor, 30 per cent glucose solution intravenously was tried, but with no better effect. On June 13, 1930, forty-eight hours after admission she was given 500 c.c. of 6 per cent gum acacia solution. Because of loss of urine around the catheter, no accurate output figures are available, but glucose injection following the acacia resulted in a diuresis as evidenced by note stating that during glucose injection patient had voided 3 times around catheter in addition to drainage. Twelve hours after the acacia, the temperature was 37.8, pulse 128, respirations 28, and the patient would respond to commands. Karo syrup solution and water were given through the nasal tube. Clinically her condition continued to improve, and on June 15, 1930, she was conscious and rational, but still slightly drowsy. She was discharged on July 1, 1930.

CASE 2.—E. R. (9601) was admitted to the hospital on Oct. 15, 1930, because she had gained 29 pounds in weight in the past two months. She was at term Nov. 22, 1930, and had had edema of the feet for two weeks. Examination: Marked edema of legs and feet. Blood pressure 140/98. Urine contained a large amount of albumin. Twenty-four hours after admission her blood pressure had increased to 175/125. She was treated with colonic irrigation, $MgSO_4$ intramuscularly, and 1000 c.c. of 20 per cent glucose intravenously. A bag was inserted at 8 P.M., but at 12 midnight she began having convulsions. They continued in spite of glucose and $MgSO_4$ and the patient became comatose. A cesarean section was performed at 4:30 A.M. and twins were delivered. At 12 noon, the patient had another convulsion. In spite of glucose solution the urinary output was poor and the patient was stuporous. Five hundred c.c. of 6 per cent gum acacia were given at 5 P.M., and repeated the next day at 12 noon. Following the second acacia injection, the urine output improved and subsequent glucose injection resulted in an excellent diuresis. The next morning (Oct. 19, 1930) the pulse had dropped from 150 to 100 and the patient was clear mentally, although still sleepy. Thereafter, her course was uneventful and she was discharged on Nov. 7, 1930.

CASE 3.—M. W. (19540) was treated at the St. Louis City Hospital by Dr. Drabkin of our staff. She was a white woman, twenty-nine years old, gravida

iv, who delivered spontaneously at 5 A.M. on Feb. 9, 1931. At 7 P.M. she had a convulsion. Her blood pressure was 210/135 and the urine contained a large amount of albumin. In the next forty-five hours she had a total of 19 convulsions. Shortly after the first, she became unconscious and remained in coma for fifty-seven hours. During this period her blood pressure remained at an average level of 170/110. During a fifty-two-hour period, 750 c.c. of urine were recovered by retention catheter and in addition, the patient voided twice. During this period the patient had 3 colonic irrigations, 60 c.c. of a 50 per cent MgSO_4 solution by mouth several times, 25 per cent MgSO_4 intramuscularly, 6 injections of 750 c.c. each of 10 per cent glucose, and glucose and Dryco through a nasal tube. After she had been in coma for fifty-one hours and was considered moribund, 200 c.c. of 30 per cent gum acacia were added to 800 c.c. of 10 per cent glucose and given at 9 P.M. At 10 P.M. the nurse's note states "urine was leaking around catheter"; at 2 A.M., 120+ c.c. were drained through the catheter and at 4 A.M., the patient was conscious and able to respond to questions. The following morning she was given soft diet and her subsequent course in so far as her toxemia was concerned was uneventful.

It is noteworthy that although convulsions had been recurring at irregular intervals in spite of intramuscular MgSO_4 , intravenous glucose, colonic irrigation, etc., and the patient was considered moribund, yet after the one injection of gum acacia solution, there were no more convulsions, coma cleared up rapidly and the urinary output was improved.

REFERENCES

- Denecke, G.: Die Eklampsie, H. Hinselmann, Bonn, 1924, F. Cohen. *Stander, H. J., and Tyler, M.*: Surg. Gynec. Obst. 31: 276, 1920. *Williams*: Obstetrics, ed. 6, 1930, D. Appleton and Co. *Stander, H. J.*: AM. J. OBST. & GYNEC. 12: 633, 1926. *Stander, H. J.*: AM. J. OBST. & GYNEC. 13: 551, 1927. *Schwarz, O. H., and Dieckmann, W. J.*: AM. J. OBST. & GYNEC. 18: 515, 1928. *Czerny, A.*: Arch. f. exper. Path. u. Pharm. 34: 268, 1894. *Erlanger, J., and Gasser, H. S.*: Ann. Surg. 69: 389, 1919. *Rogers, L.*: Brit. M. J. 2: 394, 1919. *Walker, M. A., and Keith, N. M.*: Am. J. Physiol. 95: 561, 1930. *Hartmann, Alexis*: Personal Communication. *Irving, F. C., and Taylor, J. V.*: AM. J. OBST. & GYNEC. 17: 767, 1929.

Lee: Maternal Pelvic Measurements Among the Chinese. National Med. J. China 16: 704, 1930.

The four average pelvic measurements in a series of 1,132 Chinese women were: Intercrestal, 26.14 cm.; interspinous, 23.13 cm.; external conjugate, 18.95 cm.; transverse outlet, 8.98 cm.

The pelvis in women from South China is smaller than that from either North or Central China but there is practically no difference between North and Central. The Chinese pelvis is considerably smaller than the Caucasian.

C. O. MALAND.

THE CULTURE, INCIDENCE AND TREATMENT OF TRICHOMONAS VAGINALIS*

BY EDWARD L. CORNELL, M.D., F.A.C.S., L. J. GOODMAN, M.D., AND
MABEL M. MATTHIES, M.D., CHICAGO, ILL.

(From the Prenatal Clinics of Northwestern University Medical School and Chicago Lying-In Hospital)

TRICHOMONAS vaginalis is becoming very common in the United States if one is to judge by reports oral and written which have come to our attention. Where the senior author has spoken about the disease and requested that the vaginal secretions be especially examined for this protozoon, physicians have been surprised at its frequency. One gynecologist was able to discover 75 cases in nine months in private practice where previously he had stated it was very rarely seen. For this reason this type of leucorrhea has been studied clinically by us.

Trichomonas vaginalis is a parasitic flagellate characterized by the presence of four anterior free flagella which tend to adhere in one strand basally. Attached laterally is an undulating membrane in the margin of which is a posteriorly directed flagella. Posteriorly an axostyle is present. In fresh specimens the organism is very actively motile, but as the specimen becomes cold the motion is gradually lost.

Donné, in 1836, was the first to describe the organism and he was of the opinion that it was associated with venereal disease. Kunster (1884) found it quite common in his clinic at Bordeaux, France. Dock (1891) was the first to report it in the United States. In 1916, Barlow reports 5 cases out of 100 examined in a clinic in St. Louis, Mo., but only in pathologic conditions such as chronic endometritis, endocervitis, and postpartum. Dock, Fonseca, and Marchand found the organism in the urine of men. In 1929 Davis and Colwell successfully cultured the organism.

Dextrose broth with human serum, as recommended by Davis, was first tried as a medium for growing the Trichomonas vaginalis in 10 successive cases, but without success. Then the Lynch medium, one part of human serum to ten parts of 0.5 per cent salt solution was used. In this medium the organisms grew freely. The formula was varied by using hydrocele fluid, clear and bloody, in place of the serum, and for a while a cyst fluid was used which contained a large quantity of native cholesterin. This latter was the most satisfactory medium of

*Read (by invitation) at a meeting of the Chicago Gynecological Society, November 21, 1930.

those that were tried. The Lynch medium, regular or modified, was used in 12 successive cases, and growth was obtained in 8. The 4 specimens which did not grow had been subjected to a short journey out of doors in cold weather after planting.

In several of the cases it was planned to keep the strain going as long as possible, and also to keep each culture alive as long as possible, but that was abandoned, because of the amount of work involved. However, a specimen planted on January 20 was carried through thirteen generations by April 10, transplants being made every third or fourth day. The longest time that the organisms of this strain were kept alive on these media was seventeen days, and in one instance they were capable of growth when transplanted on the sixteenth day. In one tube growth was not apparent until the eighteenth day. In several tubes the organisms became so few that none were found in the drops examined, and then after three to six days a large number were found. Another specimen was carried on for forty days, through ten generations, with survival of the organisms for ten days.

Fifteen other successive cases were planted on the media made with clear hydrocele fluid, and growth was obtained in fourteen.

Examinations of the tubes were made every third or fourth day, and at the height of the experiment as many as 160 tubes were examined in one day. In 50 per cent organisms were present, varying between a few to the drop to a hundred or more in a high-power field. At no time was any organism seen to be dividing, nor were any bodies seen that might be considered cysts.

These organisms present an interesting appearance by dark-field illumination. The light strikes the outline of the organism and leaves the body dark, while the flagellae are little streaks of flame. It is not easy, however, to count the flagellae in this way unless the motion of the protozoon is retarded.

The exact manner of transmission of the *Trichomonas vaginalis* from one individual to another is not understood. Each patient was questioned carefully as to the possible source of the infection and with the exception of one or two we have been unable to determine any common means of transmission. In these two patients we found that they had slept in the same bed with a woman who was said to have had a similar vaginal discharge although the authors did not examine either of these women to confirm the diagnosis.

It is seen in the virgin with an intact hymen and in the married woman. We are informed by H. W. Hottenstein of Akron, Ohio, that he discovered it in a child three years old. There had been a previous green discharge for three months with considerable soreness in the introitus. The diagnosis had been gonorrheal vaginitis although the stained smears were negative for the gonococci. He found active Tri-

chomonas when the patient presented herself to him. There is no question in the mind of the senior author but that many cases of vaginitis in children are due to the *Trichomonas*, although he has not been able to prove it scientifically because of the lack of material. The fact that *Trichomonas vaginalis* is diagnosed as gonorrhea in the adult so frequently leads us to this conclusion. The age of the patient seems to be no factor in the disease. We have seen it in women with senile atrophied vaginas where sexual intercourse has evidently been no factor.

Whether or not the male is able to harbor the *Trichomonas* sufficiently long to transmit infection is questionable, particularly in view of the fact that *Trichomonas* needs so much moisture for its growth. That the *Trichomonas* in the female can cause urethritis in the male is amply demonstrated by the fact that a case was brought to the attention of one of us (G) in which an acute urethritis was seen in the consort of a patient with *Trichomonas vaginalis*.

Two urologists report in an oral communication that they seldom see *Trichomonas* in the prostatic secretions or in urine specimens from males. With the prevalence of this disease in women, they should see frequent cases in men. We have seen the organism in the prostatic secretion of one man and in the urine of a second.

It is not infrequently found in the urine of women suffering with this type of leucorrhea. Many patients make no complaint while in a few a very severe cystitis develops. Ten per cent argyrol solution instillation into the bladder gives relief. We are unable to report further on the results of cures in cystitis.

A study was made to determine the percentage of pregnant women in Chicago suffering from *Trichomonas vaginalis*. This was done since there was a wide divergence of opinion in the literature as to its frequency. Frankel in a personal communication stated that 60 per cent of the women of Vienna harbored the organism. Crossen states that the *Trichomonas vaginalis* is found in about 40 per cent of all free vaginal discharges and is found in very large numbers in practically all severe and obstinate cases of vaginitis. In a series of 2000 cases Schroeder and Loeser found the flagellate in only about 6 per cent of the cases.

In the series of 581 consecutive cases it was found that 10.15 per cent of all the women harbored the organism. Of these 581 cases 500 were white women examined at the Chicago Lying-in Hospital, and in this group it was found that the incidence was only 7.6 per cent. Many of these women had taken douches before reporting for examination at the dispensary so that in all probability the percentage of infection is greatly reduced. Eighty-one of the original 581 cases were colored. They were examined at the Northwestern University pre-

natal clinic, and the percentage of infection in these patients was 26. Here, too, many of the women had taken douches before examination. In private practice (G) out of 98 cases 3 per cent harbored the organism. From these figures one is led to believe that the infection is more prevalent in the lower strata of society due perhaps to unhygienic conditions.

The method used in examining specimens was to take a small platinum loopful of vaginal secretion from the finger of the examiner and dilute immediately with warm normal saline on a hanging drop slide. The organisms are plainly seen either under low or high power of the microscope.

A woman may harbor the *Trichomonas* without producing any symptoms except an occasional increase in the vaginal discharge. The acute process is rather typical and constant. The patient will first complain of an itching of the vulva and vagina, the degree varying considerably from mild to a very severe itch. Occasionally the first complaint consists in a soreness of the vagina. The next symptom usually is a marked increase in the vaginal secretions. There may be an odor which is pungent. The amount of discharge varies from scanty to profuse. Occasionally it is so profuse that it runs down the leg. If the patient does not seek medical attention she next notices that sexual intercourse is exceedingly painful or if she is a virgin that the cleansing of the vagina is painful. The vagina feels hot at this time and the itching is usually severe. If allowed to continue the soft parts become excoriated and somewhat edematous.

Vaginal examination by the physician is usually very painful, even the insertion of a vaginal speculum is accompanied by considerable pain.

In the typical case as soon as the vaginal speculum is opened there is a very characteristic appearance of the vagina and cervix. The entire vaginal wall is covered with a light yellowish green discharge which is fluid in character. It contains many pin point sized bubbles and here and there above the film of secretion appear little red points looking very much like granulations. These give the vagina the appearance similar to the red spots on a strawberry. For this reason the term strawberry vagina has been applied. This film of secretion extends over the cervix and the strawberry spots can be readily seen in this location. When the secretion is mopped out, the vagina appears markedly reddened and the strawberry spots stand out clearly. The whole vagina is extremely tender even to the touch of cotton pledgets.

Kleegman speaks of certain types of cervical erosions as being characteristic in this type of leucorrhea. In a rather large experience, we have failed to note these erosions. There is no other type of vaginitis which clinically presents the same picture.

In mild cases, presenting few if any symptoms, the itching may be entirely absent. The secretion may not be yellow in color and the bubbles may be few in number or entirely absent. The frothy appearance was noted in only 5 per cent of the cases in the series. This does not mean that no bubbles were present, but that their presence was not marked.

It is of especial interest to note that of the 38 positive cases found in the Chicago Lying-in Hospital group only 12 complained of symptoms.

Gragert in a series of 55 pregnant women, infected with *Trichomonas*, found that the total puerperal morbidity in those cases not treated antepartum was 29.1 per cent, while in the treated cases, only 16.4 per cent.

Of the 38 positive cases found at the Chicago Lying-in Hospital, 26 came back for delivery. These were followed postpartum in order to determine the puerperal morbidity. It was found that the *Trichomonas* did not influence the lying-in period in any way. Three of the patients did have a temperature above 100° F., but it was due to erysipeloid, mastitis, and pyelitis respectively. All cases were treated before delivery, but none were free of the organism at the time of delivery. We conclude from these facts that *Trichomonas vaginalis* does not influence puerperal morbidity.

While the treatment of this disorder presents little difficulty so far as relieving the clinical symptoms, it does present many difficulties in securing a positive cure. We feel that the cures reported in the literature with such frequency have been cures of the clinical symptoms only. The *Trichomonas* have not been entirely removed from the vagina. If one is able to follow these patients over periods of many months, it is found that recurrences are very common, especially after the catamenia. Unless one warns these patients to come in at frequent intervals for hanging drop smears, many are regarded as cured by the physician when as a matter of fact the *Trichomonas* are still present in the vagina but are not at that moment causing clinical symptoms.

The senior author has used all of the treatments recommended from time to time. Among the various things that he has used may be mentioned mercuric iodine, methylene blue, gentian violet, acriflavine, glycerin with or without bicarbonate, tincture of iodine, hexylresorcinol, lead acetate, zinc oxide ointment, metapen, etc. Each of these various drugs will produce clinical cures but they have not consistently rendered the vagina clear of the *Trichomonas*. The only treatment that seems to cure consistently and permanently has been the treatment recommended by Sophia Kleegman. This consists essentially in applying Lassar's paste on wool tampons in the vagina which has been washed out with soap and water and mercuric iodine.

Recently we have used an ointment put out by Abbott & Company, using metaphen as the germicide. Up to the present time we have not seen any marked improvement in the treatment with this ointment in spite of the fact that metaphen itself seems to be a splendid germicide in other types of vaginal discharge.

The essentials in the treatment of this discharge are to have the medication come in contact with the entire vaginal mucous membrane, to have it of the type which produces a drying effect rather than a great deal of moisture, to clear up all cervical erosions, Nabothian cysts, etc., and to carry the treatment on throughout several menstrual periods. The organisms grow more rapidly at the end of the menstrual period than at any other time during the menstrual cycle. Whether or not this is due to the fact that the blood is a good medium for its growth we are not prepared to say. The Kleegman treatment can be readily carried out during the menstrual period, and it should be done for at least four or five periods after the secretions have been repeatedly reported negative for the *Trichomonas*.

The literature reports that these cases can be readily cured in the early months of pregnancy. This has not been our experience. Consistent and persistent treatment during the early months of pregnancy have failed to cure the discharge. We have been able to alleviate it and make the patients comfortable, but examinations of the secretions in the latter months of pregnancy have invariably shown the presence of *Trichomonas*. A few of these patients have been clinically free of symptoms and others have had considerable torment from the vaginal itching.

There have been patients who are clinically free of leucorrhea when not pregnant. During pregnancy the symptoms are marked. This was noted in one private patient whose history is briefly noted.

Mrs. B., No. 1769, at thirty-four years of age in her first pregnancy developed *Trichomonas vaginalis* in October. She delivered Nov. 3, 1924, the highest temperature of the puerperium being 100°. On Dec. 17, 1924, the smear was positive for *Trichomonas*. Because she was nursing a baby she was given soda bicarbonate douches which apparently cleared the discharge. On April 27, 1926, she returned nonpregnant with active *Trichomonas*. Under acriflavin tampons and soda douches she became free in June, 1926. She became pregnant in October, 1926. During this pregnancy she remained free from *Trichomonas vaginalis*. Dec. 3, 1927, five months after delivery, she returned nonpregnant with *Trichomonas* present. She remained under treatment for a month and a half with baking soda and glycerin and was pronounced free at the end of this time. She became pregnant March 28, 1929; the secretions were normal until September when we found the *Trichomonas* in great number. She was treated with soda bicarbonate douches and tampons and delivered Jan. 5, 1930. At her final examination, April 18, 1930, she was still positive for the *Trichomonas*. She decided to use baking soda douches at home and we are not certain that she is cured since she has not returned.

Thirty-two private patients (C) have been selected for the study of the various treatments recommended. These patients have been

followed sufficiently long for us to establish the status of the cure.

Lacto-Dextrin in glycerin was used in four patients as a tampon. In two patients a cure was obtained.

Aeriflavin was used in a watery solution on tampons in two cases with one cure. This patient was sixty years old and had a senile vagina.

Hexylresorcinol, in full strength, was used on wool tampons in four cases with two cures.

Lead acetate was used in five cases with one cure. This was applied in form of a one-ounce injection daily. The cure was obtained in a patient who had had several forms of treatment with no result. She finally persisted in the use of the injections for a period of about six months.

Tincture of iodine was used once with a cure but the treatment was so severe that it was given up.

Soda bicarbonate in glycerin on tampons was used in nine cases with three cures.

The Kleegman treatment was used in ten cases with seven cures. The only variation made in the treatment was to leave out the pyro-ligneous acid.

Two patients, who are still under treatment, have been under management for two years or more. These patients will remain cured for periods of two or three months and then have a return of symptoms usually following a period.

Miss L., No. 2430, a virgin of twenty-six reported April 21, 1928, complaining of a profuse vaginal discharge of five months' duration; the itching was severe. She also had dysuria; *Trichomonas* were found in great number. She was given soda bicarbonate and glycerin tampons and douches. The vagina was negative for *Trichomonas* May 14, 1928. On May 21, 1928, a smear was taken and many *Trichomonas* were found. She was then given quinine bisulphate tampons and quinine douches until June 25, 1928, when the smear was again positive. She was changed to the soda douche which she continued at home until Feb. 11, 1929, when she was started on a series of hexylresorcinol tampons until March 25, 1929, when no *Trichomonas* were found. She remained free until April 16, 1929 when she was again placed under treatment, using glycerin and colloidal iodine spray. From that time until June 3, 1929, she remained free of symptoms but positive for *Trichomonas*. She returned Sept. 10, 1929 with marked pruritus vulvae. At this time she was again strongly positive for the *Trichomonas*. She was unable to have local treatments and was given liquor zinci et alum compound as a daily injection. On Dec. 9, 1929, she began a course of Lassar's paste tampons; these were kept up throughout January. From Feb. 3, 1930, until Feb. 20, 1930, she was negative. This was just before the oncoming period, at which time we found the smears positive. She was again placed on Lassar's paste tampons during the menstrual period and again in March, 1930. She remained free of *Trichomonas* from Mar. 24, 1930, until June 16, 1930, at which time she had a recurrence. She was given the Lassar's paste treatment again throughout the remainder of June and July. She remained free until her August period, Aug. 28, 1930, when she was positive for *Trichomonas*. She was given treatment during the September

and October periods when she was pronounced free. On Nov. 6, 1930, she was again under treatment during her menstrual period. On Nov. 14, 1930, she was pronounced free. Whether this patient remains free indefinitely now remains to be seen. This case demonstrates conclusively that in spite of active treatments over a period of two years that the disease is difficult to cure and control.

One patient cured by the Kleegman treatment had been under the care of one of us for a period of a year without result. The Kleegman treatment cured this patient promptly in three months' time.

CONCLUSIONS

1. Dextrose broth with human serum was unsuccessfully used as a medium for growing *Trichomonas vaginalis*.

2. The Lynch media, plain or modified by hydrocele or cyst fluid, was very good.

3. The organism will grow on artificial media equally well in winter as in the summer.

4. The disease is seen in patients of all ages.

5. In our series of 581 pregnant women 10.15 per cent of the women harbored the organism.

6. The infection is perhaps dependent upon the hygienic life of the individual.

7. The *Trichomonas vaginalis* does not produce symptoms in all cases. Only 12 patients out of 38 positive cases in our series complained of symptoms.

8. The diagnosis of *Trichomonas vaginalis* cannot be made from the character of the discharge alone.

9. Puerperal morbidity is not increased by the presence of the *Trichomonas vaginalis*.

10. The cervical erosion mentioned by Kleegman have not been noted.

11. The modified Kleegman treatment has given the best results.

12. A cure should not be pronounced until at least four menstrual periods have elapsed without treatment of any description.

REFERENCES

- (1) Andrews, J. M.: J. Parasitol. 12: 148, 1926. (2) Crossen, H. S.: Diseases of Women, 1923, p. 282. (3) Davis, C. H.; and Colwell, C. J.: J. A. M. A. 92: 306, 1929. (4) Davis, C. H.: AM. J. OBST. & GYNEC. 18: 575, 1929. (5) DeLee, J. B.: Illinois M. J. 37: 186, 1920. (6) Dock, G.: Am. J. M. Sc. 111: 1, 1896. (7) Donn , A.: Rech. Microscop, la Natur du Mucus, Paris, 1837. (8) Escomel, E.: Bull. Soc. Path. Exot., Par. 10: No. 7, 1917. (9) Fantham, H. B., Stephens, J. W., and Theobald, F. V.: The Animal Parasites of Man, London, 1916, J. Bale. (10) Gragert, O.: Monatschr. f. Geburtsh. u. Gyn k. 5: 37, 1923. (11) Greenhill, J. P.: AM. J. OBST. & GYNEC. 16: 870, 1928. (12) Hegner, R. P.: J. Parasitol. 9: 15, 1922. (13) Ibid.: Arch. f. Gyn k. 120: 1, 1923. (14) Idem: Am. J. Hygiene 5: 302, 1925. (15) Idem: J. A. M. A. 90: 741, 1928. (16) Idem: Science 70: 530, 1929. (17) Jollos, V.: Darinflagellaten des Menschen, Handbuch der Pathogen. Mikroorganismen, ed. 2, Jena, G. Fisher, 1913, 7, 687. (18) Kessel, J. F.: J. A. M. A. 90: 1089, 1928. (19) Kleegman, S. J.: Surg. Gynec. Obst. p. 552, Oct., 1930. (20) Lewis and Carroll: Am. J. Urol. 19: 337, 1928. (21) Lynch,

K. M.: Am. J. Trop. Dis. 2: 627, 1915. (22) *Idem*: J. A. M. A. 79: 1130, 1922. (23) *Idem*: Am. J. Trop. Med. 2: 531, 1922. (24) *Idem*: Am. J. Trop. Med. 4: 537, 1924. (25) *Marchand, F.*: Zentralbl. f. Bakteriologie u. Parasitol. 15: 709, 1894; 16: 74. (26) *Meyer, O.*: Inaugural Dissertation, Berlin, 1927. (27) *Ohira, T., and Noguchi, H.*: J. Exper. Med. 25: 341, 1917. (28) *Pitterlein, W.*: Thesis de doct., Berlin, 1926. (29) *Ponoschina*: Russian J. Trop. Med. No. 91, 1923. (30) *Riba, L. W., and Perry, E.*: Am. J. Urol. 22: 563, 1929. (31) *Schroeder and Loeser*: Monatschr. f. Geburtsh. u. Gynäk. 5: 49, 1919. (32) *Webster, R. W.*: Diagnostic Methods, Philadelphia, 1923, P. Blakiston's Son and Company.

(For discussion, see page 445.)

TRICHOMONAS VAGINALIS (DONNÉ), A PRELIMINARY STUDY*

BY IRVING F. STEIN, M.D., AND ELIZABETH J. COPE, S.B., CHICAGO, ILL.
(From the Albert Kuppenheimer Fund of the Michael Reese Hospital and Nelson Morris Institute for Medical Research)

THE occurrence of flagellates in the vagina of women was recorded first by Donné¹ in 1837 and has been reported repeatedly since that time. Doek² was the first writer to report a case in this country. These flagellates have been grouped as one species and designated as *Trichomonas vaginalis*. The question of their pathogenicity is an open one. We believe, however, that they are the exciting factors in a form of vaginitis presenting a definite clinical entity. This type of vaginitis is characterized by a foul smelling, profuse purulent discharge in which large numbers of living protozoa and but few bacteria are found. Although usually found in the presence of a purulent leucorrhoea, they have also been found in the vagina in the absence of clinical symptoms. When *Trichomonas vaginalis* are present in the vagina in appreciable numbers, the clinical picture is typical. In fact, diagnosis can be predicted with a fair degree of accuracy from the patient's complaints. Itching, burning and chafing are the chief complaints associated with a profuse, offensive, and persistent discharge. The symptoms are aggravated just after the menstrual period, when vaginal pain, dyspareunia, and difficulty in walking may be experienced due to marked sealding of the opposed surfaces of the thighs. The discharge is usually greenish-yellow, or sometimes pinkish from the presence of red blood corpuscles. The odor is decidedly offensive. A characteristic of the discharge is the presence of numerous bubbles. The inner surfaces of the thighs are seen to be reddened and sticky, the labia bathed in purulent discharge, and upon separating the labia, a quantity of the purulent discharge usually escapes. The vaginal mucosa is reddened, and the papillae are distinctly enlarged, red and sometimes oozing. This change in the mucosa is most marked in the

*Read at a meeting of the Chicago Gynecological Society, November 21, 1930.

upper portion of the vagina. The cervical canal is not usually involved, and unless there is additional chronic endocervicitis, the cervical mucus is clear. The portio vaginalis, on the other hand, is mottled with superficial reddened areas. Upon examination of the discharge, many pus cells, red blood corpuscles, few bacteria and numerous actively motile *Trichomonas* may be seen in hanging drop. The material should not be taken with a swab, but with a wire loop. The addition of a drop of physiologic salt solution aids the examination both by diluting the thick purulent material and also stimulating greater activity of the flagellates. Stained slides are not satisfactory for verification of the diagnosis.

We have found *Trichomonas* in purulent leucorrhea in 76 women of various ages. Four were unmarried girls of seventeen to twenty-five years of age, in whom no evidence of gonorrhea could be found, one of whom however had been treated for gonorrhea, and all were found to have typical *Trichomonas vaginalis* vaginitis. We have treated a few patients past the menopause for irritating leucorrheal discharge in whom *Trichomonas* were found; one of these was a widow fifty-three years old who had not menstruated for seven years, and who complained of the persistent and offensive discharge for about a year. She was referred by an internist who believed that she had carcinoma of the cervix because of the blood-stained offensive discharge. Treatment is more satisfactory in this group probably because of the absent menses. The largest group were in married women of the reproductive age. In many of these there was an old history of gonorrhea and the return of a purulent discharge was thought to be a recurrence. However, we have not observed gonococcus and *Trichomonas* present at the same time in any case. A number of women first presented the picture of *Trichomonas* vaginitis after cautery treatment for chronic endocervicitis. One woman presented a chronic inflammation of Skene's tubules at the same time as a *Trichomonas* vaginitis. She was also under observation because of sterility. Upon clearing up of the above conditions she became pregnant. We have hunted for flagellates in children who have been treated for vaginitis but none were found.

Trichomonas vaginalis when examined in hanging drop is very motile, moving in circles with a characteristic vibrating motion. It is about 15 to 25 microns in length and 10 to 15 microns in width. There is a very great variation in size, however. The flagellates seen in cultures are frequently very small. They also vary greatly in shape. They may be pyriform, amoeboid, spheroidal or fusiform. Typically they are pear-shaped, rounded at the anterior and pointed at the posterior end. Anteriorly, there are four flagella which arise from blepharoplastic granules. An undulating membrane arises on the anterior

end and extends about two-thirds of the length of the cell wall. This is probably responsible for locomotion of the *Trichomonas*. Close to the anterior end of the cell body there is a large spindle-shaped nucleus, containing scattered chromatin granules and sometimes a karyosome. The body of the flagellate is finely granular, colorless and frequently contains numerous food vacuoles which may be filled with bacteria. Very little is known of the life history of *Trichomonas vaginalis*; cysts have never been identified. Reproduction is by binary longitudinal fission.^{3, 4}

Trichomonas hominis, a flagellate frequently found in the stools is morphologically similar to *Trichomonas vaginalis*. The chief variation is in the length of the undulating membrane. There is some question as to whether the two varieties are the same or are closely related. Both are seen to change in size and shape under varying conditions and, in some cultures, the undulating membrane of the *Trichomonas vaginalis* extends the entire length of the organism.

Many attempts have been made to cultivate the vaginal flagellate artificially with more or less success. Lynch⁵ was the first to report success using beef broth medium. Lynch⁶ and Greenhill⁷ both report success growing *Trichomonas* in blood serum diluted with sodium chloride, with Locke's or with Ringer's solutions. They also tried half ascites fluid and Ringer's solution according to the method of Ohira and Noguchi⁸ and sodium chloride-serum-water, Hogue's formula. Ten parts of nephritic urine to one part of blood serum was also used as a culture medium. Davis and Colwell^{9, 10} tried ordinary glucose broth, glucose brain broth and nutrient brain broth with and without the addition of blood cells with no success. Some of the flagellates survived for forty-eight hours or longer but there was no apparent increase in numbers, and no subcultures could be grown. They made repeated attempts with strains from different patients using a serum-saline-citrate medium (Hegner), Locke's solution enriched with ascites fluid, and Locke's egg medium. These likewise were unsuccessful. They secured their first successful cultures using Locke's solution plus 5 per cent human blood; later the serum only was used. Glucose broth plus 5 per cent human serum was found to be more satisfactory; one strain in this medium was carried through 23 subcultures and others through varying numbers. They noticed that the organisms retain their motility best when large tubes containing approximately 15 to 20 c.c. of medium were used. Davis' procedure was as follows:

Transfers were made every third day, taking some of the material from the bottom of the tube with a pipette because the flagellates seemed to grow there more luxuriantly. A P_H between 5.1 and 8.5 was found to be necessary for growth.

Hogue¹¹ working with *Trichomonas hominis* reports satisfactory re-

sults with the use of serum-salt-water method, 10 to 15 c.c. of a mixture of sterile sheep serum and water was added to 100 c.c. of physiologic salt-tubed in 15 to 20 c.c. amounts and put in an Arnold at 100° C. for one hour on three successive days. Transfers were made to the bottom of the tube and evaporation was prevented by sealing with a small amount of paraffin oil on top of the medium. The serum coagulated and on this coagulant the *Trichomonas* grew. Hogue found a P_H of 8 the best for rapid growth but between 7.2 and 7.4 the best for prolonged growth. Andrews¹² reported successful results growing *Trichomonas vaginalis* on agar slants which were covered with serum-saline-citrate solution. Asparagin medium was tried also but on this, growth was slow and scanty.

CLINICAL INVESTIGATION, CULTURAL STUDIES

Trichomonas have been reported consistently in four locations in the human body, namely, the rectum, the vagina, the mouth, and the lungs. In this study we are particularly interested in *Trichomonas vaginalis* and its pathogenicity.

In order to study the life cycle of the *Trichomonas vaginalis*, its habits, its individuality, relationship to other flagellates, and the method of transmission, it was necessary to find a satisfactory method of obtaining an early luxuriant culture of the organism. The material to be cultured was removed directly from the vagina by means of a sterile pipette and bulb through a bivalve speculum. This was placed in 3 to 4 c.c. of placenta broth (described later in the text) and kept as near incubator temperature as possible until it was brought to the laboratory. Microscopic examinations were made in hanging drop by daylight and with the dark-field. Inoculations were made with a sterile pipette using $\frac{1}{2}$ to 1 c.c. for each tube. A number of different media were tried before one was found which gave satisfactory results; three or four different media being tried simultaneously. Five patients with typical leucorrhea containing *Trichomonas vaginalis* brought warm stool specimens to the laboratory. Repeated and diligent search failed to reveal any flagellates present in the stool specimens. Nevertheless the first media used were those on which *Trichomonas hominis* grow rapidly.

Hogue's medium No. 1¹³ has been used very successfully in growing *Trichomonas hominis*. It is prepared by shaking one hen's egg in a flask with glass beads and adding 200 c.c. of Locke's solution. This mixture is heated in a water-bath for fifteen minutes during which time it is agitated constantly. It is then filtered through cotton with the aid of a suction pump, tubed in 10 to 15 c.c. amounts and autoclaved at 15 pounds for ten minutes. This medium was inoculated with *Trichomonas vaginalis* from 22 patients. The cultures were ex-

amined at the end of twenty-four and of forty-eight hours' incubation at 37° C. In only two cases were flagellates present at the end of either period. In one case, they lived for three days with an apparent slight increase in the number present—showing that they were not simply surviving. Subculturing on this medium was not successful. In the second case, however, *Trichomonas vaginalis* were alive at the end of twenty-four hours only and survived in one subculture for twenty-four hours. Since there was no increase in numbers and since further subculturing gave negative results, it is likely that in both the original culture and the one positive subculture there was merely a survival of some of the flagellates implanted. This medium was listed therefore as unsatisfactory for the growth of *Trichomonas vaginalis*.

The second medium tried was physiologic salt solution plus 5 per cent human blood serum. This was inoculated with eleven strains. In two only were there any flagellates present on examination after twenty-four and forty-eight hours. In one instance they survived, but apparently did not increase in numbers, for three days; in the other, for two days. This combination was likewise added to the list of unsuitable media. Dextrose veal infusion broth P_H 7.6 with 5 per cent human blood serum was tried next. Strains from 13 patients were introduced into this medium, with negative results in seven cases. In one case, *Trichomonas vaginalis* were found at the end of one day only; in another, at the end of two days and no satisfactory subcultures could be made. In three cases the flagellates were present for two days with apparently a slight increase in number, and one subculture from each, survived for one day only. In one case, motile flagellates were found after three days and two subcultures lived one and two days respectively. Only in the original cultures however was there any evidence of multiplication. This medium was therefore discarded.

The medium used by Davis⁹ was tried also. Six strains were inoculated into tubes containing 15 to 20 c.c. of Locke's solution with 5 per cent human blood serum. One showed no growth; one survived for one day only and four for two days. There was apparently a very slight increase in number in the four and subcultures were not made because a medium was desired on which the *Trichomonas vaginalis* would grow luxuriantly and for a long period of time.

A mixture of half ascites veal infusion broth P_H 7.6 and Locke's solution with 5 per cent human blood serum was inoculated with eleven strains. Two cultures were negative. In four the flagellates survived for one day and no positive subcultures could be obtained; in three, they lived for two days with survival in two subcultures for twenty-four to forty-eight hours. In two instances, the flagellates

lived for three days and could be subcultured once, surviving one day in the second culture. This medium was felt to be unsatisfactory and its use was discontinued. In an attempt to approximate conditions in the vagina, a nutrient broth, using an infusion of human placenta instead of veal as a base, was prepared (P_H 7.6) and tubed in 15 to 20 c.c. amounts, 5 per cent human blood serum was added to this immediately before it was used. *Trichomonas vaginalis* from 14 cases were put in this medium with negative results in four instances. There was a noticeable increase in the number of flagellates present in the other cultures for from one to four days, the average being two days. Subculturing was no more satisfactory than it had been with any other medium. One case was an exception, however, and lived through six subcultures, each of which survived two to three days.

Since liquid media did not give good results, it was thought that a solid medium covered with a nutrient liquid, similar to that used by Andrews,¹² might give more satisfactory results. Boeck and Drbolilav¹⁴ made a medium which answered these requirements and which they found to be very satisfactory for growing *Endamoeba histolyticus*, *Trichomonas hominis*, *Chilomastix mesnili*, and other parasites. It was prepared as follows:

"Four eggs were washed, brushed with alcohol and broken in a sterile flask containing glass beads. Fifty c.c. of Locke's solution were added and the mixture broken up by shaking. Test tubes were then filled with sufficient medium to produce a slant about 3 inches in length when coagulated with heat. The tubes were slanted in an inspissator and heated to 70° C. until the egg mixture is solidified, and then autoclaved at 15 pounds for twenty minutes. These slants are covered with either a mixture of Locke's solution and human serum or a 1 per cent solution of crystallized egg albumin."

The solutions were used alternately and gave the same results. Fifteen strains were inoculated into this medium; of these two showed no *Trichomona* after twenty-four hours and five showed them for one day only and gave negative results on subculture. Three were positive for two days with negative results on subculture. Three were positive for two days, with one and two positive subcultures. Two had motile *Trichomona* for three days but two and three subcultures were all that could be obtained from them. Therefore this was discarded.

At the same time we tried an agar using beef testicles as a source of nutriment. Slants of this medium (5 per cent agar P_H 7.6) were covered with Locke's solution and 5 per cent human blood serum. Seventeen strains were put in this medium, nine giving negative cultures. One survived for one day and four for two days with no positive subcultures. Three lived three days and two positive subcultures were obtained with very slight increase in the number of flagellates.

TWO NEW MEDIA FOR SATISFACTORY CULTIVATION OF
TRICHOMONAS VAGINALIS

Since blood was thought to be an important constituent in the medium for growing flagellates, blood agar slants were covered with Locke's solution and 5 per cent human blood serum. This proved a very satisfactory medium. Eight strains have been placed in this medium to date, and growth was secured in all. Cultures live and the flagellates multiply. The life of cultures seems to vary, however, a few living but two or three days, most of them from five to seven days and some from fifteen to twenty days. One strain lived through but 4 subcultures; another through 20; another through 17 and the remaining 5 are still alive, one in the seventh subculture, one in the eighth, one in the twenty-sixth, one in the thirty-third and one in the forty-fifth. From three to thirteen weeks have elapsed since these strains were isolated from the patients.

Another very satisfactory medium was found. Agar slants P_H 7.6 were made by the same method as veal infusion agar slants excepting that fresh human placenta was used in place of the veal. No effort was made to remove the blood, which turned chocolate, because it was believed that there might be some sex hormone present which would increase the nutritive value of the medium. Locke's solution with 5 per cent human blood serum was used to cover the slants. This medium was inoculated with strains from 9 patients, and growth was obtained in all. Two strains were allowed to die after the second subculture due to an emergency pressure of other work. One of the remaining 7 was carried through 19 subcultures and another through 17. The remaining 5 are still alive, one is in the seventh subculture, one in the eighth, one in the twenty-fifth, one in the thirty-third, and one in the forty-sixth. Between two and thirteen weeks have elapsed since these strains were first put on artificial medium. Some of the subcultures have shown multiplication for only one day. The majority however have been very actively alive for four to seven days and some have remained alive and multiplying for sixteen to twenty-nine days. In both of the last two media mentioned, it has been observed that to a certain extent, the flagellates grow more luxuriantly on artificial medium after several subcultures.

ANAEROBIC CULTURES

Andrews¹⁵ working with other species of flagellates showed that saturating the medium with oxygen or with carbon dioxide had no effect on the growth of flagellates. He also showed that they could be grown under reduced oxygen conditions. Every worker with *Trichomonas vaginalis* has observed that they grow best at the bottom of the test tube. In order to see whether *Trichomonas vaginalis* would

grow under true anaerobic conditions or simply with reduced oxygen, anaerobic cultures were made. Testicular agar with Locke's solution and 5 per cent human blood serum as described above was inoculated with *Trichomonas vaginalis* from two patients and incubated in a McIntosh and Fildes anaerobic jar.¹⁶ These cultures remained alive and increased in numbers for four and six days, and lived in subcultures for from one to seven days. Similar anaerobic cultures were made in the anaerobic jar using the blood agar medium described above. Ten strains were cultured, of which two did not grow. The remaining eight grew for from one to nine days, the average time being four days. Anaerobic cultures were made using the same method with the placenta agar medium described above. Seventeen strains were cultured, one showing no growth, and the remainder grew from one to fifteen days, the average being five days.

In all of our cultures, anaerobic and aerobic, only those in which the flagellates were actively motile and in which there was a notable increase in numbers of *Trichomona* were recorded as positive.

CONCLUSIONS

1. *Trichomonas vaginalis* is regularly found in the vaginal discharge of women complaining of offensive leucorrhea presenting a characteristic clinical picture.

2. Seventy-six cases were studied, chiefly in married women during the reproductive period. A few were observed in single girls and in women past the menopause.

3. *Trichomonas vaginalis* do not grow artificially on the same medium as do *Trichomonas hominis*.

4. Stools from five patients with vaginal trichomonas failed to reveal either *Trichomonas vaginalis* or *Trichomonas hominis*.

5. Cultures were made from 26 patients in whom *Trichomonas vaginalis* were identified by microscopic examination. All were positive by cultural methods.

6. *Trichomonas vaginalis* grow and multiply under anaerobic as well as aerobic conditions.

7. Two new media which proved most satisfactory for cultivating *Trichomonas vaginalis* have been described. Growth and multiplication of the *Trichomonas vaginalis* on these media has been carried on successfully through 40 subcultures extending over a period of three months. Five of these strains are still alive at the time of this writing.*

REFERENCES

- (1) *Donné, A.*: La Natur du Mucus, Rech. Microscop. Paris, 1837. (2) *Dock, George*: Am. J. Med. Sc. 111: 1, 1896. (3) *Craig, C. F.*: Parasitic Protozoa of Man, 1926, p. 215. (4) *Hegner, R.*: Am. J. Hygiene 5: 302, 1925. (5) *Lynch,*

*The counsel and assistance of Dr. Wm. Thalheimer and Dr. K. Howell of the Nelson Morris Institute are hereby gratefully acknowledged.

K. M.: *Am. J. Trop. Med.* 2: 531, 1922. (6) *Lynch, K. M.*: *J. A. M. A.* 79: 1130, 1922. (7) *Greenhill, J. P.*: *AM. J. OBST. & GYNEC.* 16: 870, 1928. (8) *Ohno, T., and Noguchi, H.*: *J. Exper. Med.* 25: 341, 1917. (9) *Davis, C. H.*: *AM. J. OBST. & GYNEC.* 18: 196, 1929. (10) *Davis, C. H., and Colwell, C.*: *J. A. M. A.* 92: 306, 1929. (11) *Hogue, M. J.*: *Johns Hopkins Hosp. Bull.* 33: 437, 1922. (12) *Andrews, N. M.*: *J. Trop. Med.* 32: 929, 1929. (13) *Hogue, quoted by Craig, C. F.*: *Parasitic Protozoa of Man*, 1926, p. 537. (14) *Bocck and Drbohlav*: Quoted by Craig—p. 536. (15) *Andrews, N. M.*: *J. Para.* 12: 148, 1926. (16) *McIntosh, and Fildes, P.*: *Brit. J. Exper. Path.* 2: 153, 1921.

310 SOUTH MICHIGAN AVENUE.

(For discussion, see page 445.)

WHAT ARE THE FUNCTIONS OF A UNIVERSITY WOMAN'S CLINIC?*

BY H. J. STANDER, M.D., BALTIMORE, MD.

A UNIVERSITY woman's clinic, or the well-known "Frauenklinik" of the Germans, is a hospital limited to the care of pregnant and parturient women, as well as women suffering from conditions, affections or diseases associated with, or part of, their reproductive system. The purpose of such a clinic is to afford the best possible care for all patients entering its doors, to properly educate medical students in the art and science of obstetrics and gynecology, and lastly to encourage and sponsor investigations in the all too numerous problems awaiting solution in this field of medicine.

It is not the purpose of this paper to trace the origin and development of the "Frauenklinik" or Woman's Clinic, but it is well that we recall Johann Jacob Fried, who undoubtedly founded the first true woman's clinic in the beginning of the eighteenth century, in Strasbourg, Germany. It must also be pointed out, however reluctantly, that while the woman's clinic was developed from Fried's original concept as a comprehensive whole in Germany, this was not the case in France, England, or the United States of America. In these latter countries midwifery, or obstetrics usually followed one path, and its sister or daughter branch, gynecology, traveled a different way and often became affiliated with surgery; and so men have been trained as obstetricians or as gynecologists, the two groups having nothing or very little in common. It is only recently that most of us in this branch of medicine have begun to realize that we are far behind the Germans, and that our teaching of medical students, and consequently the medical care of our patients, must be greatly lacking.

It will take us too far afield to discuss the conditions and circumstances which lead to this unfortunate separation of the two branches which constitute that part of medicine pertaining to the reproductive system of the woman. Suffice it to say that no one practicing obstet-

*Read at a meeting of The Alumni Association of the Lying-In Hospital, New York City, December 10, 1930.

ries, without a first-hand appreciation of pelvic surgery or gynecology, can do full justice to his patient; and this applies equally well to the gynecologist who is untrained in obstetrics. A few clinics in this country have fortunately adhered to the German concept of a woman's clinic, and to these we owe a great deal for preserving the ideals of Fried and his pupil, Roderer. During the past few years we have happily seen several of our leading universities taking the necessary steps toward establishing woman's clinics, and thus cementing the two branches of this medical specialty into a complete unit, which must inevitably result in more adequate care of patients, better teaching of students, and a keener appreciation and further development of research.

Why this special interest in, and this endeavor to improve the teaching of obstetrics and gynecology? The main reason lies in the fact that our maternal and fetal mortality in this country is appalling, and that inadequate obstetric training is the forerunner not only of a heightened maternal and fetal mortality, but also of a large part of gynecologic operations.

In a very thorough statistical study of maternal mortality in the United States, covering a twenty-two year period, ending in 1921, Woodbury showed that the maternal death rate increased from 13.3 in 1900 to 16.9 per 100,000 population in 1921. From puerperal infection it increased from 5.7 in 1900 to 6.8 in 1921; and from all other causes it increased from 7.6 in 1900 to 10.1 in 1921. Woodbury, in comparing maternal mortality in the United States with that in 20 foreign countries which have official registration statistics, finds the death rate in this country the highest, being 7.99 per 1000 live births; while Denmark and the Netherlands have rates of only 2.35 and 2.42, respectively. He states that although the comparability of these figures must be carefully studied before one can draw any final conclusion, it is evident that the United States ranked among the countries with the highest rates, such as New Zealand and Chile; while the British Isles and Germany occupied an intermediate position, and the Scandinavian countries and the Netherlands showed low death rates. Since statistics compiled by this author show that the total number of confinements is only about 3 per cent larger than the number of live births, the mortality rate calculated on live births gives us a fairly close approximation of the true risk of dying in childbirth; furthermore, to avoid errors arising from differences in definition of stillbirth, it is preferable to use the rate based on live births when comparing different countries. We may then express the maternal mortality rate in this country in another way, namely, that one in every 125 women die incident to childbearing; a truly staggering sacrifice. Nothing has been accomplished in the past quarter of a century to reduce this frightful death rate incident to childbirth.

Comyns Berkeley, in a brilliant lecture on the teaching of midwifery, delivered last year, stated that public opinion in England has at last been roused because of the fact that the maternal mortality and morbidity in the British Isles had not been lowered for the last twenty years, a statement which cannot be made about any other medical condition or disease. He places most, if not all, of the blame for this on the very inadequate teaching of midwifery and the diseases of women. He writes: "Midwifery and the diseases of women form one-third of all qualifying examinations for the medical student, and it is perhaps the most important of all three parts dealing, as it does, with the well-being of those who supply the nation with citizens. Again, for some reason which its teachers can never understand, midwifery has always been regarded as a specialty in the hospital world and probably also in the minds of the lay public. It is no more a specialty than medicine and surgery, forming as it does one of the Trinity of medicine. The Medical Act draws, and knows, no difference between medicine, surgery and midwifery."

I believe there can be no doubt that the inadequate teaching of obstetrics in most of the medical schools of our country is the largest single factor in the production of that high maternal mortality; and it is only by an extension and improvement in the teaching of this branch of medicine that we can ever hope to reduce this overwhelming death rate.

From this, you will observe how intimately bound together are the first two functions of a woman's clinic, the care of patients and the teaching of students. We can only hope to improve the medical care of patients and reduce the risk incident to pregnancy by affording better teaching facilities and by graduating men and women better trained in obstetrics and the diseases of women. I am not a believer in the argument that the student must obtain his experience after graduation as he does in medicine and surgery. While a student, he now gets more training in these last two than in obstetrics and gynecology, and yet he may need his knowledge of obstetrics far more urgently immediately after graduation. To quote Berkeley once more: "It appears to be forgotten or perhaps not realized, that the position of midwifery, qua the newly qualified man, is entirely different from that of medicine or surgery. General practitioners, as a body, do not practice surgery, but call in a surgeon or send their patients to a hospital. In the case of a medical disease, the practitioner has, in nearly every instance, time to turn around, and if necessary he can call in a physician or send his patient to the hospital. On the other hand, the first day a medical man is in practice, he may be 'up against' a midwifery complication which requires his immediate attention if the life of the woman and her child are to be saved, and in which there is no time to wait for the assistance of an expert. It seems to be forgotten, more often than not,

that an obstetrician is dealing at the same time with two lives, while the physician or surgeon is dealing with one at a time only." In this, I agree fully with the writer, and also when he concludes that our universities should extend the time allotted to the teaching of obstetrics and gynecology to equal that given in either medicine or surgery.

I shall now discuss under separate headings the three functions of a university woman's clinic; the care of patients, the teaching of students, and the fostering of research.

CARE OF PATIENTS

The most important function of a woman's clinic is to provide adequate nursing and medical care for all admitted to public ward or private room. It may be noted here that the Woman's Clinic of the New York Hospital-Cornell Medical College Association will have 112 public beds out of a total of 138 obstetric beds, and 32 public ward beds out of a total of 42 gynecologic beds. From these figures you will observe the very limited space allotted to private patients, amounting to only 26 out of a total of 170 beds, or about 15 per cent of the total capacity.

Under the full-time scheme, the chief of the clinic and a small number of assistants spend their whole time at and in the interests of the clinic. The running of a large woman's clinic, together with teaching and a certain amount of individual research, consumes almost, if not all, the time of the chief; and he thus has very little time to devote to private practice. I have held a full-time position in medicine for the past eight years, and know this to be the case. Full-time medicine was founded with the express purpose that the head of a department and a few assistants could give all their time to the details of the clinic, teaching and research. The chief of a university woman's clinic, therefore, should be interested primarily in these three functions, and any private patients that he may have should constitute a very small number, and take up a decidedly minor part of his time. This, of course, also applies to his few full-time assistants.

It is my idea that in the care of patients, that is, the clinical aspect of the clinic, the burden must be borne by part-time as well as full-time men. The reasons for this are that the full-time staff is too small to adequately handle a large clinic; and secondly, and perhaps of more importance, that it would lead to stagnation if a fairly large group of men, including those in private practice, were not utilized in this prime function of the clinic.

TEACHING

The medical student, the graduate who wishes to prepare himself for the practice of obstetrics and gynecology, and the practitioner who wants to spend a few weeks or months in the clinic, constitute the group

that must be taught. I agree with my present chief, Dr. Williams, that it is the duty and privilege of a university clinic to foster the teaching of the first two groups, and that the third group who wish to take postgraduate courses, should be referred to specially devised postgraduate schools. This, of course, does not mean that the general practitioner will not be welcomed to spend a few days in the clinic; but regular courses or work solely designed for his benefit had better be given in these special postgraduate schools.

Here again, in the teaching of medical students and graduates, the full-time staff urgently needs the help of the part-time specialists. The teaching can be broadened, improved and made of greater interest, by the utilization of the part-time men on the staff. The major part of the teaching, however, must be cared for by men who can give their whole and undivided time to the preparation and carrying out of this task.

RESEARCH

It is not necessary that I emphasize the many problems in obstetrics and gynecology which are in urgent need of solution. The etiology and treatment of puerperal infection, the toxemias of pregnancy, the nature and cause of menstruation, the endocrine and metabolic changes associated with the menopause, the cause of labor, the etiology of most spontaneous abortions, the best methods of treatment of many abnormalities appearing in the third trimester of pregnancy, the etiology of uterine displacements, as well as of benign and malignant growths of the female reproductive system, represent a few of these problems. For the solution of many of these questions, the investigator, in addition to being a competent clinician, must be trained in one or other of the fundamental biological or physical sciences, must possess the facilities and be prepared to devote a considerable portion of his time whole-heartedly to the question in hand. For this purpose again a full-time staff consisting of properly trained men is essential. This, however, does not imply that the university clinic should not welcome and afford opportunities to men engaged in private practice, who have the urge, the training and the time to pursue an original investigation.

I wish to emphasize here that the object of research in a woman's clinic is to solve, or attempt to solve, problems with a direct clinical bearing, as the more academic or pure scientific questions can far better be studied in the preclinical or academic departments. In order that a real bedside appreciation of problems may be had, and that the proper critique as to the solution and application of such questions may be exercised, it is essential that the staff of the clinic be composed of clinically well trained men with a knowledge of one or other of the basic sciences. It would lead to greater efficiency both clinical and experimental, and to more valuable productivity were the staff to be

composed of first-rate clinicians, each one well trained in a different fundamental science, so that anatomy, embryology, bacteriology, pathology and chemistry were all duly represented in the clinic. This is an ideal state toward which we can only hope to strive.

In concluding these remarks, I cannot refrain from commenting upon perhaps the most universal criticism of full-time medicine, which is, that the men on the full-time system are usually poor clinicians. This criticism is undoubtedly valid in some instances, but we must not forget that the system is still young, and passing through its experimental stage. It is not always an easy matter to procure men with long clinical experience who are imbued with university ideals, possessing the necessary fundamental training and willing to sacrifice a lucrative practice and assume the leadership of a large university clinic at a moderate salary. Then, also, it is well to remember that many years of private practice in obstetrics does not necessarily mean a vast experience and thorough training in the abnormalities and difficulties of the specialty. A young man on the active full-time staff of a well run moderate sized woman's clinic will see and do more abnormal obstetrics in a year than his confrere in private practice in perhaps five years, or more. It is not so much the number of years spent, as the amount of material observed, thoroughly studied, and well treated, which is the basis of sound training. To my mind, the fact that the man has schooled himself prior to his clinical training in such exact sciences as biology or bacteriology, would enable him so much the better to master his clinical work. By this, I do not mean that "laboratory men" should constitute a full-time staff, but I do insist that a training in a fundamental science is no contraindication to sound clinical training. The full-time staff of a university woman's clinic certainly has an unusual opportunity to acquire clinical proficiency.

It is also well for us to bear in mind that the only excuse for full-time medicine is to produce better doctors in every sense of the word; and if this is not accomplished, then the full-time system is a failure. We have enough faith in the system to give it a fair and thorough trial, and certainly welcome constructive and helpful criticism; but criticism engendered from personal animosities and jealousy will benefit no one.

There is one last criticism directed toward the full-time medical man, and that is that he does not possess that "indefinable something" gained from contact with private patients on the outside. Today, most, if not all, of our obstetric patients are delivered in hospitals, and certainly our operative gynecologic patients are treated in the hospital. If the full-time man is conscientious (and we can lay down no rules for those who are not), he will treat his limited number of private patients as well as the private specialist treats his. He will come in as close touch, and I speak from first hand information, with his patients as does his

associate in strictly private practice. But, whether we discuss the clinical ability or the experience gained from private patients, in the end it is the individual rather than the system of training that counts.

From the foregoing remarks on the prime functions of a university woman's clinic, it must be clear to you that such a clinic differs radically from the lying-in hospitals, maternity hospitals, and women's hospitals that are founded along purely humanitarian lines, and not at all, or only indirectly, concerned with the education and training of medical students and graduates, and are not designed, equipped, or endowed for research. There will always be a place for these latter institutions, but it is fervently hoped that the universities throughout our country will follow the lead of the few medical schools, in which we are now happy to include the New York Hospital-Cornell Medical College Association, that have seen the light and followed, although somewhat tardily, the example of the great German universities with their "Frauenklinik" or Woman's Clinics.

THE DETECTION OF IMPENDING INTRAUTERINE DEATH*

By R. S. TITUS, M.D., F.A.C.S., BOSTON, MASS.

THIS subject sounds very ambitious, and perhaps it is. Without ambition, however, we would stagnate, even in obstetrics. This paper offers no panacea for stillbirths, but it does aim to save a few babies that are now being lost. The saving of these few babies it hopes to accomplish by more intensive and intelligent prenatal care after the period of viability. It hopes to stimulate observation and appreciation of what one observes, and the knowledge that these observations may mean impending intrauterine death.

The number of cases that fall within the scope of this paper is actually very small, for in the first place we must rule out all those deaths which occur before viability. It is of academic interest to make the diagnosis at this stage of pregnancy of impending intrauterine death but of no practical value. In the second place, it rules out all stillbirths rightly attributed to poor obstetrics, passive or active, and it seems to me that almost as many stillbirths may be due to unintelligent procrastination as to over-zealous interference. In the third place, it rules out, as having nothing to do with this paper, all cases of stillbirth due to congenital abnormalities, hydrocephalus, anencephalus, congenital heart, kidney, and the like. In the fourth place, it rules out cases due to syphilis. The proportion of stillbirths due to syphilis is being decreased all the time by more intensive anti-syphilitic treatment before pregnancy occurs and during pregnancy.

*Read at a meeting of the Boston Obstetrical Society, November 18, 1930.

The large proportion of stillbirths attributed to syphilis noted in the reports of many large lying-in clinics I am sure would be much decreased if antisyphilitic treatment could be instituted as it is in private practice. In the fifth place, it rules out all cases of stillbirths occurring during febrile states, such as pneumonia, typhoid fever, and the like, for in these cases induction is never justifiable, because of the mother's illness. Pyelitis here is an exception, for induction done in the interest of the mother may relieve the pyelitic attack and so indirectly save the baby's life; but here the living child is a gratifying side issue. I make no mention, because it seems to me irrelevant, of those deaths classified by some writers as stillbirths which occur in the first week or so after delivery, which are due to trauma of delivery. These, of course, in no way will come in the scope of this paper. And so, if one peruses the tabulated statistics of stillbirths, one will find, by the process of elimination, that very few of these stillbirths can in any way interest us.

There are, nevertheless, some few stillbirths which definitely do come under the comprehension of this paper: namely, those associated with toxemias, diabetics, nephritics, and the well-recognized patient who habitually starts in labor not long after the eighth month, and delivers herself of a dead baby. The number of such cases, of course, is small, and the number possibly preventable is smaller; but I do believe that by intelligent observation after the period of viability we may appreciate that the signs of a normally developing uterus are not present, and that in some of these cases, interference at a time when viability is compatible with life may save some babies otherwise lost. Of course one must make due allowance for the lowered height of the fundus in those cases in which the presenting part is settling.

If we are to detect impending intrauterine death, all cases beyond seven months should be given more intensive prenatal care than is now often practiced. Certain cases are more prone to disaster, but all women beyond this stage are deserving of our best attention. The office visit after this time should be a more frequent one; perhaps a two-week interval is none too frequent. Palpation is of the greatest importance. We all know that the healthy, normally developing fetus grows unceasingly, and this growth is shown in an increase in the size of the uterus. This size should be noted carefully at each visit, and absence of growth or retrogression in size at any time shows that the uterine contents either are not growing or have shrunk. If the fetal heart is present, we know the baby is still living. If the fetal heart has ceased, we know the baby is dead, and our observation is of no practical value.

Weighing patients is of inestimable value all during pregnancy and particularly at this time. The amount of weight that any given patient should gain, I think, depends entirely upon the patient. I think

it is perfectly possible for an extremely fat woman to actually lose weight during pregnancy, but the ordinary case should gain at least one-half pound a week. A marked increase over this weight may mean twins, edema, hydramnios, a very large baby, or, more commonly, an unnecessary increase in bodily weight. An absence of an increase in weight, especially with the appearance of edema, or a marked diminution in weight means, if there be no reason for the loss, such as an intercurrent infection, that the intrauterine contents are not developing. The appreciation of the nongrowth of the uterus, with a present fetal heart, with a loss of weight or a lack of increase in weight, at a time in pregnancy compatible with viability, should always arouse our interest and bring up the question of interference; and if this patient be well in the limit of viability, I am certain that induction will save some babies that procrastination will lose.

Now, a few words as to the handling of those patients in whom we should appreciate that the occurrence of intrauterine death after viability is most common. I have reference to diabetics, nephritics, toxemics and the mother who delivers herself habitually of a dead baby not long after eight months. Insulin has changed the treatment of diabetics so remarkably that all our views regarding diabetes in pregnancy must be altered. Ten years ago pregnancy occurring in severe diabetics was such a serious burden that abortion was a frequently advised operation. It is safe to say today that diabetic patients who have the same degree of severity, may much more safely undertake pregnancy and will, carefully and intelligently handled, have a perfectly good chance of a living child, with very little danger to themselves. The diabetic patient should not gain too much weight. The few that I have handled I am sure have been better when their gain in weight has been constant but small. It has long been recognized that diabetic patients are apt to have big babies and that not infrequently they deliver themselves at term of big babies that are macerated; and so in the handling of these diabetic patients I feel that they should be seen alternately by the diabetic specialist and by the obstetrician each week during their entire pregnancy, that their weight should be carefully noted, that their blood sugar should be done each week and that the uterus should be palpated and its growth recorded. I feel too that after eight months diabetic patients should be hospitalized, that their blood sugar should be done daily, that they should be weighed daily and that the uterus should be palpated daily; and that the presence of edema and the presence of albuminuria should be recognized in these diabetics as of extremely serious prognostic significance. It is only in this way, I think, that the shrinkage of the uterus or its nonincrease in size will be noted in time to prevent the delivery of a macerated baby.

In regard to toxemic patients, it has not been customary to induce labor in toxemic patients except when toxemic mothers were becoming more sick; in other words, the induction of labor has always been for the benefit of the mother. I feel certain that there are many toxemic babies that might be saved by induction if more systematic, intelligent observation of the uterus were practiced. I have one case to report, a toxemic patient who was not sick enough to be delivered and in whom I made a diagnosis of shrunken uterus. Labor was induced, and a baby weighing 3 pounds 10 ounces was delivered. This baby was about ten days short of term, and it was not until it was getting food that a 7½ pound baby would normally require that it was at all satisfied. I think that toxemic patients should be seen more frequently and many of them should be hospitalized and observed as I have suggested, if we are to get the occasional case with a present fetal heart and decreasing size of the uterus in time to interfere before intrauterine death results.

What has been said about toxemic patients applies perhaps more truly to nephritic patients. It has long been recognized that the woman with moderately severe nephritis may go to eight months or beyond with a living child, only subsequently to have that baby delivered dead. I believe that those nephritic patients who are allowed to continue pregnancy for the sake of a baby should be hospitalized as soon after seven months as the individual case seems to warrant. I think they should be watched most carefully, because we know that oftentimes with the intrauterine death of the baby the amelioration of their nephritic symptoms takes place. With diminution in the size of the uterus and actual loss of weight as far as the mother goes, and where the case has progressed far enough to be compatible with viability, in the presence of an active fetal heart, I feel that induction will save some children which delay will lose.

What has been said about nephritic patients holds true almost word for word for those unfortunate women who carry living babies for eight months or a little more. Maybe some of these are nephritic patients, but certainly there are some who show, with clinical and laboratory tests, no symptoms of nephritis whatsoever. I have one patient now who has two living children and who has had two dead babies, one at seven and one-half months and one at a little over eight months. Her Wassermann was negative, all her kidney tests were normal, she had a normal blood pressure and I am told that during her previous pregnancies she showed no albuminuria. Soon after seven months I shall insist upon hospitalizing her, I shall watch her carefully day by day, and at the first suggestion of a decrease in the size of the uterus, if the fetal heart is still present, I shall induce labor.

In support of this contention that the diagnosis of impending intrauterine death is possible, I shall briefly review the following cases.

In some the appreciation of impending death occurred at a time when interference would have resulted in no material gain. In another a living child was obtained more by the grace of God than by my foresight, for, although I realized that the uterus had shrunk, I did not have sense enough to deduce what it meant. Another case was that of a diabetic patient, and in this case a macerated baby was delivered, which would have been saved had induction been instituted when it was appreciated that the uterus was not growing.

CASE 1.—Para i (1018), thirty-three years old, due the early part of November. Patient had had a very stormy past history, was away for a long time with tuberculosis, had had pleurisy, had been operated upon for duodenal ulcer. She had a rather uncomfortable pregnancy, with more than a normal amount of indigestion. She started her pregnancy weighing $117\frac{1}{4}$, which was a bit more than her normal weight. Her weight increased slowly until on the thirtieth of September, six months after her first visit, she weighed 136 pounds. On the fourteenth of October she weighed $138\frac{1}{2}$ pounds and on the twenty-first of October she weighed $138\frac{1}{2}$ pounds, there being no gain in weight in a week. At this time the uterus was small, it was a small baby, and the head was at brim. Both her urine and blood pressure remained normal. When I saw her at home on the twenty-eighth of October my comment was that the baby had fallen, because the uterus seemed smaller. The fetal heart was distinct but the vaginal examination showed the head nowhere near the pelvis. I did not then appreciate what all this meant. A week later, on the fifth of November, the patient started in labor and a section was done because of bleeding due to a separated placenta. The baby weighed four pounds. On examination of the placenta it was perfectly evident that the baby was getting only enough nourishment from the placenta to maintain life. The baby certainly would not have lived if left to vaginal delivery. In this case I realized that the uterus had not grown but I did not appreciate its significance. The living baby was a result of kindness on the part of nature, not due to any foresight of mine.

CASE 2.—Para ii (1823), forty years old, due the twelfth of April. Pregnancy progressed normally, increased in weight gradually. At the time of her first visit, the fifteenth of August, she weighed $120\frac{1}{4}$, on the nineteenth of February she weighed $145\frac{1}{2}$ and on the twelfth of March she weighed $146\frac{1}{4}$, which is a gain of only $\frac{3}{4}$ pound in thirteen days. In the meantime, however, she developed a good amount of edema, the uterus was distinctly smaller than on her previous visit, her blood pressure was 130/80, and her urine showed a trace of albumin. She was, therefore, induced by rupture of the membranes on the twenty-eighth of March, and a baby, long and thin, which weighed 3 pounds 10 ounces was delivered. The placenta showed a definite area of infarction. Her first baby weighed 7 pounds 10 ounces.

CASE 3.—Para iii (1795), thirty-five years old, baby due the twenty-second of November. Diabetes had been discovered during her second pregnancy, five years previous to my seeing her. She had had one full-term baby and one stillborn baby at seven months. This patient progressed normally as far as her diabetes was concerned. Her gain in weight was slow and gradual. She began to develop edema in September. She weighed $131\frac{1}{4}$ on the eleventh of October and 130 on the twenty-fifth of October. On the eleventh of October the baby seemed small with a lot of water; on the twenty-fifth of October the uterus was distinctly smaller. The fetal heart was distinct and her blood pressure was 110. On the seventh of November the uterus seemed smaller and certainly no bigger than at her previous visit. The fetal

heart at this time was distinct. A few days later the patient telephoned that she thought that she had not felt the baby and when I saw her subsequently the baby was definitely dead. She delivered herself of a macerated fetus a week after that. In retrospect, I believe that if I had delivered her when the uterus began to shrink a live child would have been delivered. I have learned something but the experience is bitter.

CASE 4.—Para iii (1472), thirty-two years old, due the twenty-fifth of March. Patient had two normal children. On the twenty-first of February she weighed 157¼ and one week later she had gained a quarter of a pound. The uterus seemed to be growing little, if any, probably none. The fetal heart was distinct. Her urine specimens were all negative. On the thirteenth of March it was perfectly evident that the baby had died. There was no fetal heart and the uterus was distinctly smaller. An x-ray was taken which confirmed my diagnosis. The patient was induced and a macerated baby was delivered.

CASE 5.—Para iii (1672), thirty-four years old, due the seventh of May. Pregnancy progressed normally until the end of February, previous to which time she had had the grippe, and on the twenty-first of February she came in to see me, feeling rather poorly. The uterus at that time seemed all right, she weighed 142¼ pounds, her blood pressure was 122/60, and she had no edema. On the thirteenth of March, three weeks later, the uterus did not seem to me to have increased in size at all. The patient, however, had increased in weight. There was a question about the fetal heart. I felt then that there was something wrong with the pregnancy. A week later the patient delivered a macerated fetus.

CASE 6.—Para ii (1684), twenty-seven years old, due the nineteenth of April. The patient was seen first the eighth of October, at which time the uterus was three months in size and everything was as it should be. On the twentieth of November there was some question about the size of the uterus and on the ninth of December the patient had a small amount of discharge of blood and the uterus had distinctly decreased in size. This, of course, has no practical bearing but shows that the decrease in size of the uterus may definitely be noted.

In conclusion, I think that impending intrauterine death may be detected in a small number of patients and that the number of cases in which this is possible is necessarily small. Most of the cases will occur in diabetic, nephritic, and toxemic patients, and in the eighth-month habitual miscarrier. I believe that the possibility of detecting intrauterine death before it occurs depends upon more active, more intelligent prenatal care, more frequent office visits, hospitalization in certain patients after the period of viability. I believe that the nongrowth or the shrinkage of the uterus and the presence of a decrease or no increase in weight are the significant signs which point to impending intrauterine death. I believe that these signs should stimulate us at least to the consideration of the need of induction, and I believe that a certain number of babies now lost might be saved.

472 COMMONWEALTH AVENUE.

(For discussion, see page 451.)

THE CONTRACTIONS OF THE MONKEY UTERUS AT TERM

BY A. C. IVY, PH.D., M.D., CHICAGO, ILL., CARL G. HARTMAN, PH.D.,
AND ARTHUR KOFF, M.D., BALTIMORE, MD.

*(From the Department of Physiology, Northwestern University, School of Medicine,
Chicago, and Carnegie Laboratory of Embryology, Baltimore)*

NOTABLE progress has been made during the past quarter century in the physiology and pharmacology of the smooth muscle of the visceral organs, especially the gut. Numerous methods have been employed, including the oldest, that of direct observation. In the female the musculature of the genital tract has been the subject of numerous studies to elucidate the factors involved in the transport of the egg through the tube, their spacing in the uterine horns in the case of multiparous animals and, from a practical standpoint most important of all, the behavior of the organs in the expulsion of the fetus at birth. The method of direct observation through windows placed in the abdominal wall of rabbits (Wijsenbeek and Grevenstuk, 1922) has led to important contributions to the physiology of the uterus as seen *in situ*.

Recently Rudolph and Ivy (1930) studied the behavior of the uterus, cervix, and vagina in the dog and the rabbit during parturition. The method was chiefly that of direct observation. As soon as the animal was seen to be definitely in labor, it was placed under light ether anesthesia, the abdomen opened, the uterus with its chain of ampullae, or embryonic chambers, laid bare. It was found that the lowest ampulla engaged in strong contractions first, the remainder of the uterine horns remaining more or less quiescent. The fetus is advanced both by a strong cylindrical band of circular contractions, that spread downward, and by a longitudinal shortening. The retreat of the fetus is prevented by a persistent longitudinal contraction or "retraction." The evacuation of the fetus from the ampulla is analogous to the evacuation of the colon in the dog in every respect except that it occurs at a slower rate. The fetus next passes into the corpus uteri, which is now dilated by the presenting part. By a contraction of sphincters at the junction of the horns and the corpus uteri and the circular fibers at the vault of the latter, the fetus is expelled through cervix and vagina and by the latter, as well as by the contraction of the abdominal walls, to the outside world. The placenta is loosened by a natural Credé, namely, marked contraction of the longitudinal muscles which greatly shortens the ampulla and renders it a passive birth canal for the fetus next in line.

Stimulation of the hypogastric plexus and the nervus erigens Rudolph and Ivy found gave results that lacked uniformity, hence they

concluded that the extrinsic nerves of the uterus play a subordinate rôle in parturition. Epinephrine acts inhibitorily on spontaneous contractions and decreases or abolishes the action of pituitrin as well as that of gynergen. Intrauterine pressure resulted in a rupture of the corpus uteri, which suggested to the authors that the lower segment of the human uterus is homologous to the body of bicornuate uteri as found in carnivores, rodents, and other orders of mammals. The present paper offers an interesting confirmation of their view.

Interesting as these new results appeared, they yet fell short of direct applicability to the human condition because of the palpable differences between the human uterus and that of the laboratory mammals. Opportunity presented itself at the Carnegie Colony of rhesus monkeys to apply Rudolph and Ivy's method of study to the parturient monkey uterus. The experiments proved encouraging and, while still far from complete, gave results which it is thought would interest the student of comparative obstetrics. We can now state, for example, just how the wave of contraction passes over the simplex type of uterus which characterizes man and primate animals. We wish also to present views on the homology of the part of the uterus of primates and other mammalian orders as based on the new physiologic data. Some further experiments on the effect of drugs are included.

Two animals were used. Their histories are given below. It is seen that both were multiparae and practically at term.

PROTOCOL OF NO. 117

Female No. 117 was received direct from India, April 12, 1930, with a batch of two dozen mothers nursing yearling babies. She, too, although she failed to claim any baby of the group, had been nursing within some weeks, for small drops of milk were still expressible from the breasts. April 30, palpation showed the baby's head to be the size of an egg, dead and slightly softened. Normally an embryo attains this size about the sixteenth to seventeenth week of gestation; and if we assume that the baby had been dead in utero for three weeks, we have a gestation period of about twenty weeks; but it may have been more. The experiment took place May 8, the beginning of the estimated twenty-second week. We have had a viable baby born as early as this estimate; so we may assume that the uterus was well prepared for the expulsion of the fetus, especially since, at the time of the experiment, the contents of the ovum were macerated into a shapeless mass.

PROTOCOL OF NO. 78

The history of female No. 78 of the Carnegie Colony is a brief one. She was received September 11, 1929, and conceived two months later. A slight bleeding occurred September 13, October 9 and 11, November 8, the intervals or cycle lengths being twenty-six and thirty days respectively. A mating with male I day 10 of the October cycle proved ineffective. Early in November she received an ugly scalp wound and was placed in a paddock with male B, an adolescent. The actual day of conception can only be estimated from the day of appearance of the placental sign. Calculating back sixteen days from the date of its first appearance we set the day of conception on November 23. This we know from experience with numerous pregnancies cannot be far from the truth.

By rectal bimanual palpation the progress of the gestation was followed. On May 8, the one hundred sixty-ninth day of gestation, or four days over the average duration of gestation, parturition had not yet taken place. These conditions combined with the injured scalp lead to the selection of this animal for the experiments recorded below.

METHOD

The subject was tracheotomized and kept under the ether as lightly as possible. Thus, No. 117 consumed only 60 c.c. of ether out of the ether bottle in ten hours. The abdomen was opened and the uterus exposed for direct observation of the contractions. These were observed and recorded for several hours before the uterus was touched or subjected to chemical or nervous stimulation. Motion pictures were also made from time to time. These turned out to be, from the nature of the subject, difficult to read; but when seen repeatedly they convey a fair picture of the contraction waves that pass over the organ and are useful in checking up the results of direct observation. This was done by all three of us and written up independently, and the notes compared and agreement reached on all essentials. The subjective element was thus reduced as much as possible.

After several hours of observing the intact uterus in this way, various means of stimulation were employed: mechanical, as by pushing the finger into the wall; faradic stimulation of the extrinsic nerves, injection of pitocin, epinephrine, or ergotamine tartrate. The uterus was then emptied of its contents and a double balloon (Diagram 1) inserted (Fig. 6) in order to record the effects upon the

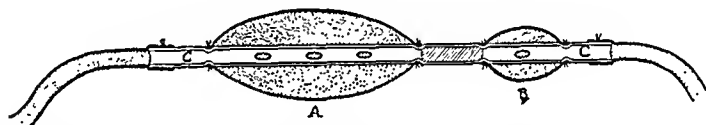


Diagram 1.—The balloon arrangement used to make a graphic record of the movements of the postpartum uterus. *A*, the balloon placed in the fundus; *B*, the balloon placed in the cervical sphincter. A nonflexible tube *C* was used in order to keep the balloon in a permanent position.

smoked drum. One balloon recorded the contractions of the uterus, the other of the cervix. This was especially successful in the second specimen. No. 117 was delivered by an incision through the fundus; in the second case (No. 78) the baby, in breech presentation, was delivered per vaginam. The difficulties experienced in extracting the head because of the excessive contractions of a powerful sphincter in the region of the internal os (Fig. 2) was surprising, inasmuch as so great resistance was not expected in so small an animal. In the second case also an incision was made in the fundus for the insertion of the balloons.

THE CONTRACTION WAVE

The contraction wave of the human uterus intrapartum has probably not yet been observed. The reason for this is that during cesarean section the incision is made too small to view more than a small portion of the uterus, combined with the natural inhibition which the visceral organs suffer upon first exposure to the atmosphere. There is probably, therefore, here presented for the first time a description of the behavior of the parturient uterus of one primate.

Inasmuch as the conditions in the two animals were somewhat different, No. 117 containing a macerated fetus and placenta, No. 78 a living baby and intact placenta (Fig. 7), the two cases will be described separately.

No. 117.—Typically, the contraction wave in No. 117 began at both corners of the uterus (the "pace-makers") ventral and cranial (approximately 1.5 cm.) to the insertion of the tubes and passes in ever widening concentric waves, elliptical in form, forward and medially until the waves meet in the midline. They often travel caudally, along the midline, involving a longitudinal shortening of the lower segment, following which there occurs a circular contraction originating near the line of insertion of the round ligaments (Fig. 6), associated with some longitudinal shortening of the uterus in this region. The entire process may consume three to eight or more seconds.

Occasionally one "pace-maker" only would be involved, as shown by blanching on one side only and bulging of the uterus at the opposite side. Such a wave may pass entirely over to the opposite side or die out in the midline. But such unilateral action is exceptional. Mechanical stimulation at the lower part of the lower segment caused a reversal of the wave, as did stimulation of the hypogastric plexus. The latter, however, usually caused a normal contraction, sometimes involving only the dorsal aspect of the organ; but stimulation of the nerves seemed to have a deleterious effect upon the muscle since the spontaneous contractions became weaker and less frequent.

The "pace-maker" is usually quite red, that is, relaxed, hence does not itself participate in the contractions described.

No. 78.—In the case of No. 78 every condition seemed normal. As seen in Fig. 1 the uterus is dome-shaped, due to the primary placenta bulging up the ventral area; for it should be noted that this species of monkey has a double discoidal placenta, the secondary structure being supplied by blood vessels crossing the chorion from the primary. The placentas of No. 78 seen in Fig. 7 are exceptional in having but two connecting vessels where there are usually many (up to 15) between the primary and the secondary discs.

The contraction waves in the second experiment (No. 78) originated and traveled approximately as described in No. 117, with the exception that the placental areas were less affected by the wave of contraction. There thus resulted a coronal furrow about the upper segment due to shortening in the portion between the placental sites, which caused the placental area to appear like a raised plaque as stated above. As in the preceding cases there was an area about the insertion of the tubes, about 15 mm. in diameter, which failed to blanch during the contraction phase. Following the contraction of the upper segment the lower segment manifested a longitudinal shortening with some circular contraction as shown by longitudinal striae. The wall of the lower segment was palpably the thinner. With each contraction of the upper segment the breech was forced farther downward into the lower segment, causing distention of the latter. At the same time at the opposite pole, the head was outlined and formed a slight elevation, at which point the uterine musculature was more blanched, hence more violently contracted, due doubtless to the mechanical or "stretch" stimulus.

THE CERVICAL SPHINCTER

For most of its extent the cervix is an extremely soft, yielding structure at the end of pregnancy, as we know from fifteen or more cases palpated by the rectal bimanual method. This is what we would expect from Stieve's histologic study of the wall at this stage. However, at the level of the internal os there develops during pregnancy, a band which may be felt by the inserted finger as a definite ridge. It is visible externally as a band 4 to 6 mm. in width and may be well



Figs. 1-3.—1, Lateral view of uterus showing the "relative inertia" of the placental sites and the "coronal" contraction of the fundus. The pencil marks the lower edge of the placenta. 2, the postpartum uterus. "a" the arcuate tendency. "b" the lower segment. Note the contraction of underlying circular muscle. The pencil marks the lower edge of the cervical band or sphincter, below which is the vagina exposed by pubiotomy. 3, same as 2, but showing a contraction of the upper segment to be followed shortly by a contraction of the lower segment.

seen in Fig. 2 at the tip of the pencil (also in Fig. 3, but not at the tip of the pencil).

The sphincter undergoes considerable excursion of contraction and relaxation, at times leaving the lumen dilated as much as a quarter dollar (2.5 cm.); then contracting down so that the finger can be inserted only with difficulty. The force of the spontaneous contraction is comparable to that of the cardiac sphincter of the stomach, but may at times be *much* stronger. Such is the usual behavior of the sphincter postpartum, as we know from palpation of many cases, a result which is in agreement with the observations of the obstetrician on the human mother.

The contraction of the sphincter was usually independent of the upper or lower uterine segment, i.e., it might contract when the lower segment was relaxed or vice versa. In a number of instances the digital dilatation of the sphincter caused a strong contraction of the fundus or upper segment which then travelled in a normal manner. The reverse of this, i.e., relaxation of the corpus uteri upon mechanical stimulation of the sphincter was not observed in the monkey, but was not looked for especially.

FORCIBLE DELIVERY OF BABY

Since spontaneous labor did not occur an attempt was made to extract it per vaginam. The baby, it should be recalled, was in breech presentation. During the procedure the sphincter was kept in view and was observed to exert a resistance far greater than could be accounted for solely on the basis of muscular action, although it is evident that such a sphincter has a decided mechanical advantage. Considerable difficulty was, therefore, experienced in the delivery of the after-coming head, which failed to pass until a tear occurred in the sphincter. If there is also a sphincter in the human being, we can see what care must be exercised to prevent strangulation of the baby in breech presentation, for the greater the pull the greater the "stretch" stimulus upon the muscle fibers of the sphincter.

During the manual delivery of the head the upper segment was contracted but not as markedly as it was just after the delivery was completed. Since during the extraction of the head the lower segment was handled, our observations concerning its activity do not apply to the normal.

The third stage of labor was also closely observed. After delivery of the head the upper segment contracted in the region of the insertion of the tubes, the contraction spreading to involve the placental site where it persisted as a prolonged contraction. The lower segment became markedly relaxed, being filled with placenta, and the sphincter remained visibly dilated, but because of the tear it could not be ascertained whether or not it contracted intermittently. After forty min-

utes' wait, traction was placed on the cord, which caused umbilication followed by strong contraction of the fundus. Twenty minutes later the Credé procedure resulted in delivery of the placenta (Fig. 5). The uterus immediately contracted in toto and became pear-shaped (Figs.



Figs. 4-7.—4, Sagittal section of the uterus. 5, Showing (a) Credé of upper segment, causing contraction of same, and (b) the lower segment dilated with the placenta and relatively relaxed, and (c) a portion of the placenta projecting from the vagina. 6, The uterus is markedly contracted due to the mechanical stimulation set up by the insertion of the balloons (white structure between fingers). 7, showing the double or duplex placenta immediately after birth. The pencil touches one of the two communicating vessels (vein and artery in juxtaposition in each case).

2 and 3); the placental sites being especially blanched, doubtless an adaptive mechanism for the control of hemorrhage.

In this behavior of the uterus in labor the lower segment does not remain a passive structure, it is really contracted firmly postpartum,

as may be seen by the pronounced longitudinal ridges of the postpartum organ (Figs. 2 and 3). When the fetus is partly in the vaginal canal, it functions to expel the fetus by contracting behind it, and remains relaxed when dilated by the presence of the placenta, contracting firmly after this is passed, throwing the surface into very characteristic ridges.

HOMOLOGY OF PARTS

It becomes a painful necessity to reopen a question which lovers of peace thought settled by gynecologists for thirty years, namely, the homology of the parts of the uterus. We may first consider certain terms that are in vogue in the literature:

(1) *Fundus*, that part cranial to the line joining the insertions of the tubes, a purely anatomical concept without special significance. (2) *Isthmus*; a histologically well-defined transitional part between cervix and body, which is drawn into the uterine cavity with the growing dilatation of the uterus in pregnancy and which yet remains free of embryonic envelopes. (3) "*Bandl's ring*," anatomically nondemonstrable, seems to be clinically manifest in the so-called "hourglass" uterus, a phenomenon which we succeeded in imitating by injection of pitocin. "*Braun's ring*" and "*contraction ring*" are further terms used in the same connection. That there is great confusion at this point appears from Williams' discussion of the subject in his *Obstetrics*, and no wonder, when our ideas are based on several frozen sections only and these studied by different investigators. In the present study we shall use the term "*contraction ring*" tentatively to designate the dividing line between upper and lower uterine segment. (4) *Upper segment* and *Lower segment* we have adopted as valid divisions because it is possible to demonstrate them as physiologic units (see Fig. 2, "*a*," upper segment; "*b*," lower segment).

The distinctness of upper and lower segments is apparent from the respective behavior of the parts in the course of pregnancy. Hartman has found from palpation of the organs of numerous female monkeys throughout pregnancy that the lower segment softens faster than the upper, since it is not included in implantation, hence does not contain any part of the distending ovum, which for the first part of gestation lends firmness to the uterus. In this he corroborates for the monkey what obstetricians have known for the human female since the time of Hegar's important results.

In this connection we cannot avoid the temptation to speculate upon the problem of homologies between the bicornate uterus (of the dog for example) and the simple uterus of the monkey. Rudolph and Ivy (1930) have already expressed the view that the corpus uteri of the dog is the homologue of the lower segment in man. The present work on the monkey adds much to this conviction. The appearance of the lower segment of the monkey uterus immediately postpartum, when both segments are maximally contracted and the striae are prominent (Figs. 2 and 3), is most strikingly like the postpartum corpus uteri of the dog in the same stage. The contraction ring would thus become nothing else than the lower sphincters of the uterine horns, fused into one; the upper segment becomes the fused horns themselves. We may

add in passing that the rhesus uterus as well as that of other macaques still display, in their markedly arcuate uteri, the tendency to the bicornate condition.

MAMMO-UTERINE REFLEX

It is well known that placing the baby to the human breast causes uterine "after pains" in the early puerperium; this is thought to play an important rôle in the involution of the postpartum uterus. It was thought worth while to obtain definite evidence on this point in the monkey. The only experimental pertinent work known to us was that of Ivy (unpublished). He placed a balloon in the uterus of a parturient goat (1-3 days) and obtained uterine contractions on placing the kid to the udder.

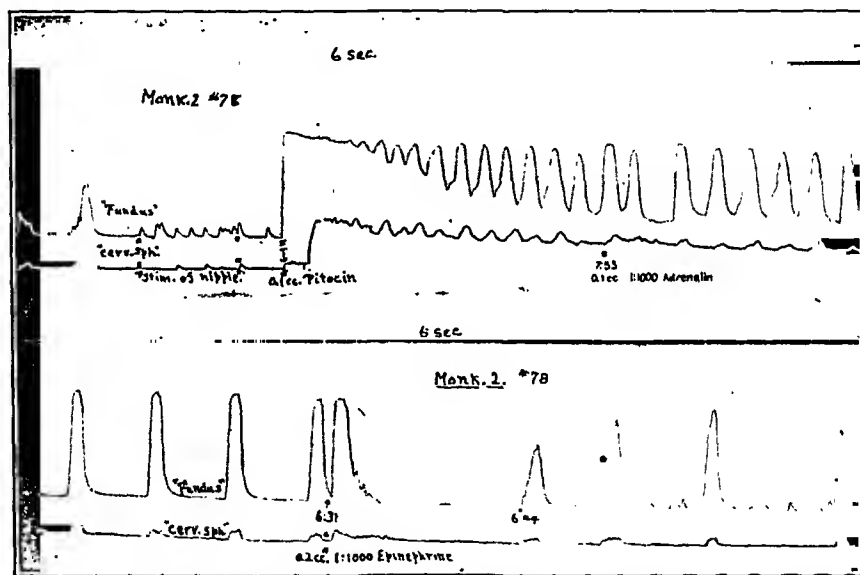


Fig. 8.—The upper tracing shows (1) the mammo-uterine reflex, (2) the action of pituitrin on the monkey's postpartum uterus, and (3) the inhibitory action of epinephrine.

The lower tracing shows the effect of epinephrine on the spontaneous contractions.

In both monkeys electrical or mechanical (milking) stimulation of the nipple caused contractions that were less vigorous than the spontaneous contractions of the uterus (Fig. 8). In monkey No. 78 each time the nipple was stimulated a nursing movement of the mouth and tongue resulted.

DRUGS

Since no one has reported observations on the effect of drugs on the uterus in vivo of the monkey, we decided to determine the effect of pituitrin, epinephrine, and ergotamine on the uterus of the two monkeys at hand.

The action of these drugs was observed by direct vision and photography prior to delivery and by graphic records from a balloon in the

postpartum uterus. The drugs were injected slowly intravenously during the period of one minute for the most part because of the time factor and the limited number of animals at our disposal.

Epinephrine.—Epinephrine in doses of from 0.1 to 0.2 c.c. of 1:1000 caused in both the anti- and postpartum uterus a single contraction followed by absence of contractions for a period of five minutes or longer.

Epinephrine also inhibited temporarily the contractions induced by pituitrin (Fig. 8).

These effects of epinephrine on the monkey's uterus in vivo were identical with the effects on the dog's uterus in vivo observed by Rudolph and Ivy (1930). The pharmacologic literature and possible clinical application of these observations are pointed out in their paper.

Pituitrin.—Pituitrin (0.1 c.c.) caused a marked and prolonged contraction of all parts of the ante- and postpartum uterus. This was followed by rapid intermittent contractions of gradually diminishing tone (Fig. 8), or without full relaxation between contractions.

The effect of pituitrin on the antepartum uterus of the monkey deserves a more detailed statement. Very soon after the injection, blanched areas at various points on the surface of the uterus appear, including the region of the round ligaments. This was followed by a circular contraction at the insertion of the round ligaments or the junction of the upper and lower uterine segments, which produced a definite "hourglass" effect, the lower segment being larger than the upper segment. This was followed by a contraction of all parts of the uterus, including the cervical band or sphincter, which converted the organ into the shape of a pear, the upper segment now being larger than the lower. This spasm of the entire uterus gradually disappears to be replaced by rhythmic contractions more rapid in rate than normal, which persist for twenty minutes. *It is very evident after watching the normal uterine movements, that the movements induced by pituitrin are little calculated to expel the fetus.* Epinephrine reduced the spasm.

It is obvious from this description of the action of pituitrin that in the doses used it markedly disturbs the coordinated and purposeful character of the uterine contractions. The various portions of the uterus respond at different rates as is shown by the blanched areas and the "hourglass" effect, which may be due either to a momentary variation in blood supply to these parts or to a variation in the susceptibility of the contractile mechanism of these parts to the action of pituitrin. The contraction ring which resulted at the junction of the upper and lower segments and which is regarded by us as homologous to the fundal sphincters of the dog, is significant, as is also the fact that the cervical sphincter contracts under the influence of pituitrin. Hence,

it is not surprising that obstetricians have occasionally experienced trouble on using pituitrin during labor and find that even when it is given at the end of the second stage the birth of the placenta may be delayed.

It might be objected that our doses were excessive, which we grant and assign reasons for above. However, it should be kept in mind that an "average dose" may in a susceptible uterine mechanism give the picture of overdosage.

Ergotamine.—Ergotamine and "ergotol" both caused a temporary augmentation of rate and amplitude of the uterine contractions. Their effect was surprisingly slight when compared to that of pituitrin. They produced no violent spasm and did not disturb the coordinated and purposeful character of the uterine contractions.

COORDINATION OF UTERINE CONTRACTIONS

The above description of the passage of the wave of contraction over the uterine horns as viewed by direct vision shows that the wave of contraction passes over the uterus according to a definite plan or sequence. Rudolph and Ivy (this Journal) in studying the dog found that a wave started near the insertion of the tubes and traveled over the horn and then onto the corpus uteri (lower segment).

Since the passage of the wave in the monkey was analogous to that in the dog, balloons were placed in the uterus so as to obtain a graphic record of the sequence of contractions. It was found that the cervical sphincter contracted from four to seven seconds after the contraction of the fundus started. This was timed with a watch and is detectable in Fig. 8 with difficulty because of the necessary reduction of the tracing. The chief point of this observation is that it shows that there must exist some kind of a coordinating mechanism in the primate uterine horns and that it is subject to physiologic study by the methods used by Rudolph and Ivy in the dog's uterus.

SUMMARY

1. The present study, while far from complete, records for the first time the manner in which the wave of contraction passes over the parturient uterus simplex of the monkey. Presumably a similar action characterizes the very comparable human uterus.

2. From a constantly quiescent area slightly ventral and cranial to the insertion of the tubes, elliptical, concentric waves of contraction pass medially to meet in the midline and cranial border of the uterus, passing caudally, then involving the lower segment and finally the cervix uteri.

3. Such contractions, after they reach the midline, follow the conducting bundle postulated by Hofbauer (1930) (not macroscopically demonstrable in the monkey). The contractions pass as we would

expect on the basis of the homologies outlined above as well as the embryologic development of the parts of uterus and tubes. The placental site is less involved by contractions than the remainder of the uterus.

4. The homologies referred to suggest that the lower segment of the primate uterus represents the corpus of bicornuate uteri; the upper segment the fused horns, the contraction ring, the cornual sphincters. This view is supported on both anatomic and physiologic grounds.

5. The musculature of the cervix is chiefly concentrated into a powerful sphincter at the internal os, which may be felt by the examining finger from the lumen side and may be seen externally (see Figs. 2 and 3). This sphincter is of the greatest obstetric importance, at least in the monkey. Upon delivery the uterus contracts maximally, forming the typical picture seen in Figs. 2 and 3. Contraction is greatest in the region of the placental sites, which further reduces the dangers of hemorrhage.

6. The pregnant and the parturient uterus are relatively nonirritable to nerve stimulation.

7. Stimulation of the mammary nipples causes a slight increase in the rate of the contractions.

8. Pituitrin (pitocin), in the dosage employed, causes spastic contractions over the entire uterus, followed by intermittent contractions without full relaxation. The contraction wave of normal sequence does not occur, hence the contractions after pitocin are little calculated to expel the fetus.

9. Adrenalin causes a primary contraction followed by temporary quiescence. It also abolishes the contraction due to pituitrin or ergotamine, the latter of which had only a mild action in the doses employed.

Wehefritz and Gierhake: The Urea Content of the Placenta. *Arch. f. Gynäk.* 339: 479, 1930.

The authors find from their investigations that there is a temporary production of urea in the placenta and further that the placental urea content is usually high (11.7) under even the most normal conditions. This urea content is markedly increased in the more severe forms of toxemias of pregnancy. As may be surmised, the highest values are found in patients suffering from eclampsia. Here the urea content is increased to 50 mg. The authors therefore raise the question of placental poisoning due to such a heavy concentration of urea and discuss the effects of such a placental poisoning on both mother and fetus.

RALPH A. REIS.

LEIOMYOSARCOMA OF THE UTERUS, WITH A REPORT OF FOUR PERSONAL CASES*

BY SAMUEL R. MEAKER, M.D., F.A.C.S., BOSTON, MASS.

Professor of Gynecology, Boston University School of Medicine

IN EVERY clinic where operating-room specimens are routinely subjected to careful histopathologic study, a certain proportion of tumors clinically diagnosed as leiomyoma of the uterus are identified by the laboratory as leiomyosarcoma. While the incidence of this finding varies with different observers, the average of all reports indicates that about 1 per cent of supposed leiomyomas will show histologic malignancy.

It is obvious enough that no such percentage of uterine muscular tumors is malignant in the clinical sense. Neoplasms of this type do not metastasize and do not recur after removal, except in the rarest instances. Myosarcoma of the uterus is now, as it was before the days of hysterectomy, an exceedingly uncommon cause of death. Ewing states that in twenty years he has encountered only three cases of malignant uterine myomas with general metastases.

True myoma malignum, though rare, is nevertheless a well-defined clinical entity. It was first described by Virchow seventy years ago, and has been the subject of many later communications. This tumor metastasizes to remote organs, especially to the liver, lungs, kidneys, and lymph nodes; it tends to recur in the cervix after supravaginal hysterectomy; and it produces a cachexia which terminates fatally.

In most types of tumor the various grades and degrees of clinical malignancy run approximately parallel with corresponding histologic evidence. Leiomyosarcoma is an exception, in that tumors showing a considerable degree of histologic malignancy are often clinically benign. Only when the malignancy rises above a certain threshold does the growth burst its bounds and become an actual menace to life. It is, unfortunately, impossible to define that threshold. No one can distinguish a priori between the relatively harmless leiomyosarcoma and the true myoma malignum, though a clear distinction certainly exists. In practice, therefore, an attempt to differentiate histologic from clinical malignancy is unsound. Every leiomyosarcoma must be regarded and treated as a potentially dangerous neoplasm, even though it be well understood that the majority of such tumors are in fact relatively harmless.

*Read before the Boston Obstetrical Society, November 18, 1930.

PATHOLOGY

As regards gross pathology, the features of uterine leiomyosarcoma are closely similar to those of the benign myoma. Leiomyosarcoma occurs most frequently in the corpus uteri, and less often in the cervix. Its position may be subserous, interstitial, or submucous, and it may be encapsulated or diffuse. The tumors are single or multiple, and vary within wide limits as to size. Different types of degeneration are common.

From the microscopic viewpoint these neoplasms are characteristically cellular with great variation in the predominating type of cell, which is most often the round cell or the spindle cell. The general opinion among pathologists is that all mural uterine sarcomas are of myogenic origin, irrespective of the cell-type which is evolved. A criterion of malignancy is afforded by irregularities and inequalities of the size, shape, arrangement, differentiation, and staining-reaction of the cells, better perhaps than by such indications of simple rapid growth as mitotic figures, giant cells, scanty stroma, and newly-formed blood vessels.

In discussing the histopathologic picture, Ewing points out that ordinary myomas vary in structure in different portions and probably at different periods. "It must be considered that suspicious changes may not always be progressive, but may signify merely a temporary or local acceleration of growth which may subside and even regress. They do not seem to justify their designation as sarcomatous transformations, for which much more extensively altered areas or even general metastases might well be demanded. Sarcomatous tendencies and precancerous changes do not constitute real sarcoma or cancer." This sound but academic distinction cannot, of course, be safely taken as a basis for clinical procedure.

Leiomyosarcoma may develop as a primary tumor independent of benign myoma. Having so developed, it may secondarily invade a co-existing myoma. Some leiomyosarcomas appear to develop within preexisting myomas, but it is a question whether these result from genuine transformation of a previously benign growth, or whether such tumors actually possess a sort of latent malignancy from the beginning. It appears to me that the uncertainty upon this point justifies a somewhat radical attitude in the treatment of all uterine muscular tumors, even when they are not productive of symptoms.

DIAGNOSIS

A preoperative diagnosis of leiomyosarcoma of the uterus is rarely made, since the symptoms and signs of this tumor are practically identical with those produced by benign leiomyoma. Rapidity of growth is probably the most informative single datum; while slow-

growing tumors may or may not be malignant, those that grow rapidly are always worthy of suspicion.

Even at operation the recognition of leiomyosarcoma is by no means easy. Dannreuther has defined the distinguishing features as follows: (1) unusual friability of the broad ligaments; (2) remarkable vascularity of the tumor; (3) absence of a sharp line of demarcation between the tumor and the myometrium; (4) difficulty in shelling out the tumor from its apparent circumscribed limits; (5) an opaque appearance on section; and (6) an edematous and sparsely fasciculated appearance of the cut surface, which is softer than that of a fibromyoma. These careful observations undoubtedly provide the best standards at present available for the recognition of leiomyosarcoma by gross appearance. Nevertheless a larger experience than mine is required to apply them practically. With Dannreuther's standards in mind I have critically scrutinized every myomatous uterus seen at operation during the past two years. As a result I have been strongly suspicious of three tumors which proved to be benign, while at the same time I entertained no suspicion whatever in two cases of genuine leiomyosarcoma.

Only by continued attention to the problem of gross diagnosis will the judgment of the individual gynecologist become more discriminating. To this end it should be invariable routine, when hysterectomy is done for myoma, to open the uterus and carefully to examine the tumor before the pelvic wound is closed. Thus in a certain number of cases, at least, the patient will be given the benefit of reasonable doubt.

TREATMENT

Good results in the treatment of uterine leiomyosarcoma have been obtained by radiation alone, according to reports from certain European clinics. It would appear, however, that the most satisfactory treatment is radical operation, panhysterectomy with bilateral salpingo-oophorectomy, followed by deep x-rays.

When supracervical hysterectomy has been performed on a mistaken diagnosis of leiomyoma, the question of dealing with the cervical stump arises. Since myoma malignum commonly recurs in the cervix, I feel that there should be further treatment, preferably with radium, in all such cases.

REPORT OF CASES

During the two-year period 1928-1929 I found four leiomyosarcomas of the uterus in a series of 107 hysterectomies performed for supposed fibroid tumor. A brief report of these four cases is presented.

CASE 1.—Mrs. R. P., aged forty years, sought advice for amenorrhea and abdominal enlargement.

History.—The past history was good. Menstruation began at fourteen, and was regular and normal up until the onset of the present illness. She was married fifteen years, and had one child twelve years old.

For six months there had been complete amenorrhea, and for about three months the patient had noticed increasing enlargement of the lower abdomen. Slight constipation and variable pain in the left lower quadrant completed the tale of symptoms. There were no mammary, gastric, or vesical disturbances, and no hot flashes. Her own physician considered her pregnant.

Examination showed the uterus to be represented by a symmetrical hard tumor of the size of a five months' pregnancy, lying deep in the pelvis and movable only within narrow limits. A diagnosis of leiomyoma was made.

Operation proved to be difficult, for the tumor lay chiefly within the left broad ligament and had dislocated both the left ureter and the bladder. A subtotal hysterectomy with bilateral salpingo-oophorectomy was performed.

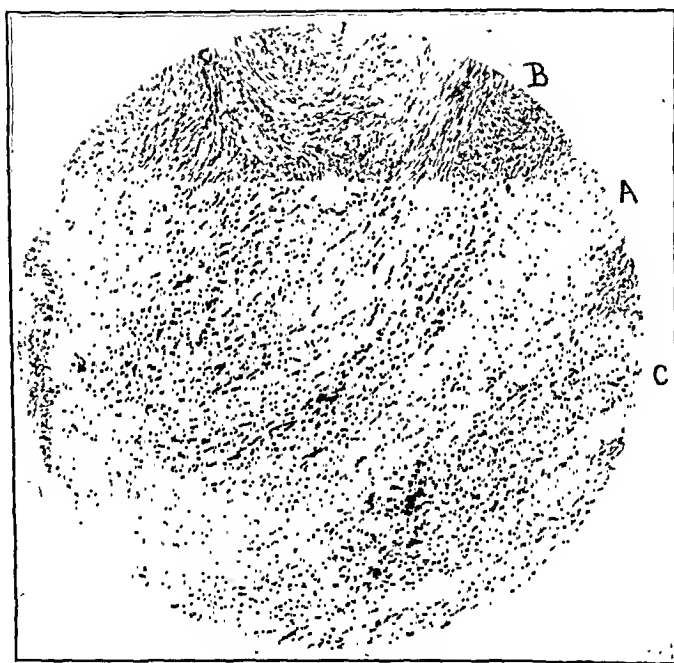


Fig. 1.—Section of tumor from Case 3, magnified 65 diameters. This low-power view shows a portion of the tumor capsule (A), the irregular growth of muscle-bundles in the leiomyosarcoma (B), and, by way of contrast, normal myometrium (C).

The immediate convalescence was uneventful except for superficial wound-infection. Several x-ray treatments were given. Ten months after operation the patient was in good health, and had gained ten pounds. A year later she died, the clinical diagnosis being malignant tumor of the lungs. Autopsy was not obtained.

*Pathological Report.**—The specimen is uterus, tubes, and ovaries.

The uterus is spherical in shape, 12 cm. in diameter, and shows no cervical portion. The serosa is dull yellow-gray in color, and smooth; the vessels are slightly injected. The myometrium is 0.7 cm. thick, and dull red-gray in color; it surrounds a spherical tumor-mass 10 cm. in diameter, yellow-white in color, for the most part firm, and with vessels markedly injected. One quadrant is definitely soft and mushy and contains much free clotted blood. The tubes are 7.5×0.2 cm. in size, moderately firm, and dull dark yellow-red in color; they show no gross pathology. The ovaries

*I am indebted to Dr. Charles F. Branch for the pathologic reports on these four cases, as well as for assistance in the preparation of photomicrographs.

are $2 \times 1 \times 0.5$ cm. in size, pearl-white in color, and moderately firm; they show no gross pathology.

On microscopic section the soft portion of the tumor-mass in the uterine wall is found to consist of closely packed, deeply staining, rather elliptical cells, having little cytoplasm, being rather uniform in size, and presenting numerous mitotic figures. The walls of the fallopian tubes are densely infiltrated throughout with lymphocytes, plasma cells, and endothelial cells, but are apparently not distended and do not show any evidence of an acute process. The ovaries are not remarkable save that one of them contains a simple cyst lined by low cuboidal epithelium.

The pathologic diagnosis is rapidly growing leiomyosarcoma of the uterus, chronic salpingitis, and simple cyst of the ovary.

Comment.—This tumor was evidently a true myoma malignum, in which the histologic picture gave an accurate measurement of the clinical malignancy. Amenorrhea was a remarkable symptom, probably best explained as a menopausal phenomenon.

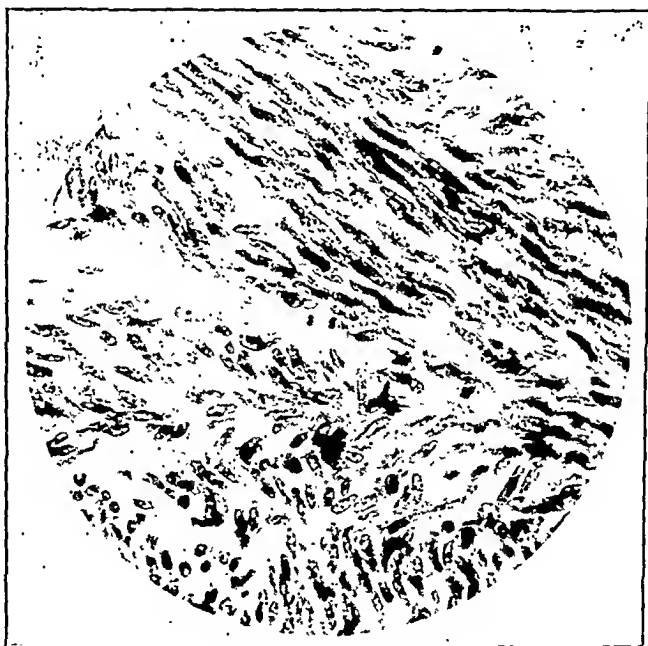


Fig. 2.—Section of tumor from Case 4, magnified 365 diameters. The cells show slight variation in size, shape, and staining-reaction. In the center of the field is a mitotic figure.

CASE 2.—Mrs. B. G., thirty-one years old, came to the clinic complaining of progressive abdominal enlargement.

History.—The patient gave an irrelevant past history. Her periods began at twelve years of age; they were always regular, moderate, and in every way normal. In twelve years of marriage she had borne four children, the youngest being three years old.

The sole complaint was a gradual steady increase in the size of the abdomen, noted by the patient for a year.

Examination revealed an abdominal tumor, smooth and resilient, extending from the symphysis to about 8 cm. above the umbilicus, and 18 or 20 cm. in width. Per vaginam nothing could be identified except the lower pole of this tumor, which seemed to be continuous with the cervix. X-ray showed no fetal skeleton.

Under spinocain anesthesia the abdomen was opened. The tumor was identified as a large leiomyoma of the uterus, and supravaginal hysterectomy with bilateral salpingo-oophorectomy was performed.

The patient made an uneventful recovery, and received several x-ray treatments. Eighteen months after operation she was free from all symptoms and signs of trouble.

Pathologic Report.—The specimen is uterus, tubes, and ovaries.

The uterus, lacking its cervical portion, measures $20 \times 17 \times 14$ cm. It has been opened by the surgeon, and the tissues are stripped back to expose a tumor in the myometrium. The tumor is encapsulated, gray in color, moderately injected, and slightly soft in consistency. On section it consists of whorls and thick interlacing strands of gray-white tissue. The muscularis is 3.5 cm. in thickness, its fibers are yellow-gray, and the blood vessels are prominent. The uterine cavity is enlarged. The endometrium is 0.3 cm. in thickness, gray, glistening, smooth, soft in con-

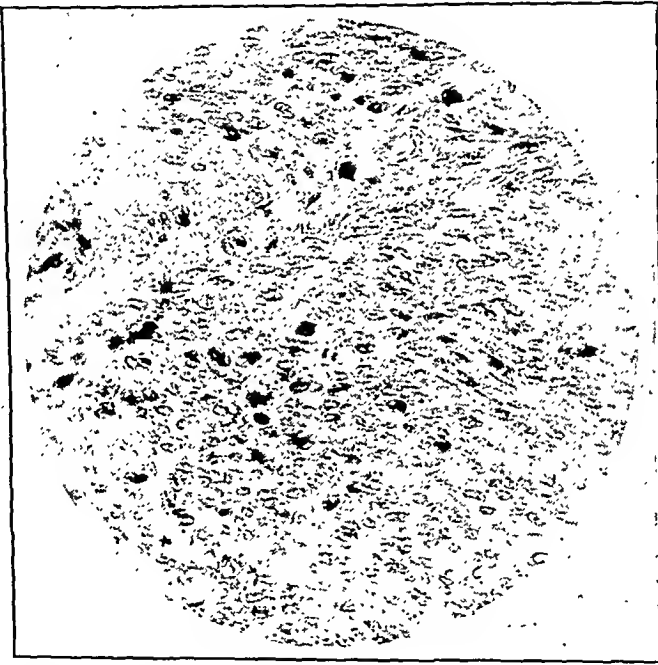


Fig. 3.—Section of tumor from Case 2, magnified 365 diameters. There is moderate variation in the size, shape, and staining-reaction of the cells. Two mitotic figures are seen. This tumor is histologically more malignant than the one shown in Fig. 2.

sistency, and slightly injected. The tubes measure 7×1 cm. and 10×0.8 cm., and are slightly tortuous. Their surfaces are covered with minute translucent cysts, gray in color; the blood vessels are injected; the fimbriae are free. The ovaries measure $4 \times 2 \times 1.8$ cm. and $5.5 \times 2.5 \times 1$ cm. They are attached to the tubes through the broad ligaments, and are slightly firm in consistency. Their surfaces are pitted and ridged, gray-white in color, and not injected. On section the ovarian tissue consists of interlacing white fibers and contains several blood-filled cysts, the largest 0.5 cm. in diameter.

Microscopic section through the large tumor-mass in the uterus shows rather loosely interwoven bands of smooth-muscle fibers which vary somewhat in size, shape, and staining-reaction, present numerous pyknotic nuclei, and show large areas of degeneration. The tumor is moderately vascular, and occasional mitotic figures are present. The endometrium shows a premenstrual phase, but is otherwise not remarkable. The tubes are not remarkable save for a moderate engorgement

of the walls and serosa. The ovaries contain numerous small cystic cavities; most of these are lined with the remnants of follicular epithelium, but an occasional one is lined with low cuboidal epithelium.

The pathologic diagnosis is cystic oophoritis and leiomyosarcoma of the uterus.

CASE 3.—Miss E. B., thirty-nine years of age, consulted her physician for excessive flowing.

History.—The patient had rheumatic fever at fourteen, which left her with mitral stenosis and regurgitation, chronic myocarditis, and pericardial adhesions. This condition was fairly well compensated. Catamenia began at eighteen years of age; the flow had always been regular and normal until the beginning of the present illness. She was unmarried and nulliparous.

For seven months the periods, still occurring at regular twenty-eight-day intervals, had been increasing in duration and amount. The last two times there had been profuse flowing, with large clots, for eighteen and twenty-one days. As a result she was markedly anemic, with a hemoglobin of 50 per cent and a red blood count of 2,920,000.

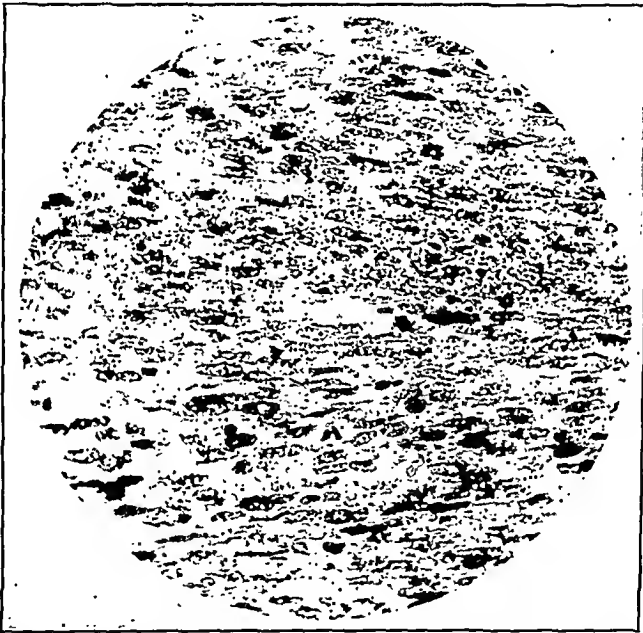


Fig. 4.—Section of tumor from Case 1, magnified 365 diameters. Here there is marked variation in the cellular characteristics. Several atypical mitotic figures are seen. The picture is that of a rapidly growing myoma malignum.

Pelvic examination showed a uterus about twice normal size, nodular, hard, and freely movable. The diagnosis of leiomyoma seemed obvious.

The patient's age, her cardiac condition, and the smallness of the tumor all combined to make the case appear an ideal one for radiation. Accordingly 5 x-ray treatments were given, with most unsatisfactory results. Instead of stopping, the flow became more profuse, and her anemia increased to an alarming extent. After a transfusion of 400 c.c. of blood, operation was undertaken. When the abdomen was opened about 200 c.c. of fresh blood was found free in the peritoneal cavity; this had evidently come from a recently ruptured follicle in the right ovary, which was still bleeding. Supravaginal hysterectomy with right salpingo-oophorectomy was quickly and easily performed.

The postoperative convalescence was complicated by acute tonsillitis and by phlebitis in both legs. Two months later the patient received an x-ray treatment

and an intracervical application of 1200 milligram-hours of radium. A year after operation there was no evidence of local trouble, and her general condition was excellent except for the chronic cardiac disability.

Pathologic Report.—The specimen is uterus, one tube, and one ovary.

The uterus shows in its cavity a rounded pedunculated nodule, pale in color and firm in consistency, $2.5 \times 3 \times 3$ cm. in size. There are also several small tumors in the myometrium. The endometrium is thick and soft. The tube shows no gross abnormality. The ovary is grossly normal; a recently ruptured follicle is seen.

On microscopic examination the endometrium is slightly hyperplastic. The glands are tortuous and irregular. The lining epithelium is hyperplastic and thrown into papillary folds, and shows an occasional tendency to heap up. The supporting stroma is edematous, and densely infiltrated with the products of acute inflammation. The myometrium is edematous, and infiltrated with large numbers of lymphocytes and plasma cells as well as occasional endothelial cells and neutrophils. In the wall there is a circumscribed tumor-mass, composed of closely interwoven smooth muscle-fibers supported by a very small amount of poorly vascular connective tissue. The individual muscle-fibers are hyperplastic, faintly staining, and somewhat irregular in shape. Numerous mitotic figures are present and among them are several diasters.

The pathologic diagnosis is acute endometritis, chronic myometritis, and leiomyosarcoma of the uterus.

Comment.—The endometritis and myometritis probably represent a tissue-reaction to the x-rays. It is remarkable that the bleeding was not controlled by radiation, and also that ovulation could occur, since a full castrating dose was given.

CASE 4.—Mrs. F. C., aged forty-five years, sought medical advice because of excessive flowing.

History.—The past history included considerable sickness, but nothing relevant to the pelvic problem. Menstruation became established at ten years of age, and was regular and normal up to the time when the present illness began. In two marriages, the first dating back twenty-five years, the patient had borne three children, of whom the youngest was thirteen years old.

For about eighteen months the periods, still maintaining a twenty-eight-day regularity, had been profuse and prolonged, lasting ordinarily two full weeks. On the first day of the flow she experienced some pain on urination. Her weight, 186 pounds, had remained constant for years.

Examination showed a uterus irregularly enlarged to about three times the normal size, moderately soft, and freely movable. The preoperative diagnosis was leiomyoma.

At the time of operation the softness of the tumor was again noted. A supracervical hysterectomy with routine appendectomy was performed.

The patient had a normal postoperative convalescence. After five weeks the cervix was treated with a 1200 milligram-hour dose of radium. Eight months later there was no sign of local trouble, and the general health was good.

Pathologic Report.—The specimen is supracervical uterus and appendix.

The uterus is distorted in shape and enlarged, measuring $10 \times 8 \times 6$ cm. The endometrium is 0.3 cm. in thickness, glistening, and pearl-gray in color; its vessels are markedly injected, and it shows scattered areas of hemorrhage. Section through the uterus shows a large intramuscular tumor-mass measuring 7.5×6 cm., consisting of a network of interwoven whitish-gray fibers. The remainder of the muscularis measures 1.8 cm. in thickness, and is not remarkable. The serosa is pink, smooth, and glistening, with vessels moderately injected. There is one firm subserous tumor-mass 1×1 cm. The appendix measures 7.3 cm. in length and 0.7 cm. in diameter. Its serosa is smooth, glistening, and pearl-gray in color, with the vessels moderately injected. The lumen contains soft fecal material.

Microscopic section shows that the endometrium is edematous. There are some areas of hemorrhage, and many of the glands are filled with a hemorrhagic exudate. The glands tend to be tortuous and somewhat fern-like, and contain accumulations of lymphocytes. Section of the uterine tumor shows rather loosely arranged bundles of smooth muscle-cells, supported by a relatively large amount of moderately vascular connective tissue. The cells of the muscle-bundles are, in general, hyperplastic; they vary somewhat in their size, shape, and staining-reaction, and present not infrequent mitotic figures. What little reaction is noted throughout the tumor-mass consists essentially of a few scattered lymphocytes and plasma cells. The myometrium is slightly edematous, and contains small scattered accumulations of lymphocytes. The appendix shows a marked increase of connective tissue and fat-cells in the fibro-fatty layer. Numerous lymphatics throughout its wall are occluded with lymphocytes.

The pathologic diagnosis is healed chronic appendicitis, chronic endometritis, chronic myometritis, and leiomyosarcoma of the uterus.

SUMMARY

1. Leiomyosarcoma of the uterus is a fairly common tumor, being found in about 1 per cent of all myomatous uteri examined.
2. While all leiomyosarcomas show some degree of histologic malignancy, only a small proportion of them prove to be clinically malignant.
3. Nevertheless all leiomyosarcomas must be treated as at least potentially malignant, since it is impossible to distinguish a priori between histologic and clinical malignancy.
4. The gross pathology of this tumor is similar to that of leiomyoma, save for minor details often none too well defined. The microscopic pathology is chiefly remarkable for great variation in cellular characteristics.
5. Diagnosis is difficult both before and at operation, though certain gross features suggestive of malignancy have been described.
6. Every myomatous uterus removed should be opened and examined before the operation is completed.
7. The treatment of choice is radical operation, followed by x-rays. When supracervical hysterectomy has been done, the cervix should be treated with radium.
8. Four cases of leiomyosarcoma of the uterus, one of them a true myoma malignum, are reported.

INTESTINAL OBSTRUCTION IN THE NEWBORN DUE TO MUCOUS PLUG*

BY FREDERICK H. FALLS, M.S., M.D., AND RICHARD H. JAFFE, M.D.,
CHICAGO, ILL.

(From the Departments of Obstetrics and Gynecology and of Pathology,
University of Illinois College of Medicine)

INTESTINAL obstruction in the newborn is a comparatively rare condition. When it occurs, it is fraught with all of the ordinary dangers surrounding this condition when it occurs in adults, plus the feeble resistance of the newborn to the shock of operative intervention. The most common etiologic factors are developmental defects in the large or small bowel or, less commonly in the stomach or esophagus. Intussusception or volvulus, involving usually the large bowel, and mechanical obstruction by pressure from without by tumors, may occur. Paralytic ileus or adhesion bands which are so commonly seen in the adults with intestinal obstruction are very rare in the newborn.

During the last three years we have seen 4 babies with intestinal obstruction which was due to a collection of inspissated mucus in the rectum and in one extending upward into the sigmoid colon.

This condition has been called *colica mucosa* by the German pathologists and consists essentially in a complete obstruction of the lower bowel for a varying distance of from 3 to 5 cm. by a plug of tenacious mucus that is closely adherent to the bowel wall. There is no evident narrowing of the bowel wall at this point and no pathologic condition evident in the wall at the point of attachment of the mucous plug, sufficient to be of pathogenic significance.

This type of plugs is not uncommon in newborn babies. They occur, according to our observation, in about 1 per cent of all cases. However, if only those that cause difficulty, such as temporary or permanent obstruction, are considered, not more than one-fifth of 1 per cent are observed and only occasionally does the obstruction persist and produce death. The symptoms are insidious in onset and usually are overlooked by the attendant for from twenty-four to forty-eight hours. The baby takes water normally, sleeps well, and shows no evidence of distress or abnormality. They then begin to show some distention and vomiting; and regurgitation of food of greater or less extent may be noted. The baby may be restless and cry fretfully, but does not seem to have any acute pain. The skin of the abdomen may appear shiny and tense. No fluid wave can be made out and no

*Read at a meeting of the Central Association of Obstetricians and Gynecologists, October 9, 1930.

peristaltic waves are noted. No peritoneal reaction is noted on sudden release of the abdominal wall after pressure. History of obstipation may or may not be obtained. In 2 of our cases the nurse's record showed that the infant had had meconium stools. This was evidently a mistake in observation. There have been no symptoms of absorption of toxins from the bowel, such as fever or significant leucocytosis.

On attempting to give an enema the tube meets obstruction a centimeter or so inside the anal orifice and the water returns clear. In some cases the thermometer cannot be inserted into the rectum for temperature readings. This may be the finding that first calls attention to the condition. Cyanosis was seen in 2 of our cases and in 1 infant that showed rigidity of the abdomen as well as distention and vomiting, a diagnosis of associated peritonitis was made. If the condition is a transient affair, relief of all symptoms follows the passage of a plug of mucus which is usually about two inches long and is greyish colored at the lower end and greenish meconium-stained at the upper end.

The following cases illustrate various clinical types of the condition that we have seen.

CASE 1.—Baby boy R. I. B., was born spontaneously September 28, 1927 at 9:30 A.M. He was premature about one month, weighed 2380 grams, and was in good condition. The baby was apparently normal until Sept. 30 at 4 P.M. at which time he had a blue spell from which he recovered quickly. Two hours later he was found to be cyanotic and in respiratory distress and the abdomen was markedly distended. A tracheal catheter was passed but no accumulation of mucus was found in the trachea. Attempts to relieve the abdominal distention by a colon irrigation was unsuccessful because the tube met obstruction about two inches from the anal orifice and the water returned clear. A diagnosis of acute intestinal obstruction was made (probably volvulus in nature) and operation was decided upon.

A midline suprapubic incision was made under local infiltration anesthesia, one-half per cent novocaine and adrenalin, three drops to the ounce. A large amount of meconium was found in the peritoneal cavity. A rapid exploration of the sigmoid and rectum revealed no volvulus nor was the obstruction plug in the lumen of the rectum, noted. On searching further for the opening from which meconium had escaped, a perforating ulcer about three-fourths of a centimeter in diameter was found in the hepatic flexure of the colon. This was rapidly closed with a fine silk Lembert suture. The abdominal cavity was washed with normal saline solution to remove as much meconium as possible and the peritoneum and fascia were closed with fine catgut. The skin was closed with interrupted linen sutures. One hundred c.c. of normal saline solution was given hypodermically.

The general condition of the baby was poor at the end of the operation which took about thirty minutes. He expired at 1:15 A.M. the next morning.

NECROPSY.—Normally built white baby boy. Weight: 2380 grams; length 42 cm. Abdomen distended. A recent sutured operative wound in the anterior abdominal wall in the midline above the umbilicus 10 cm. long. The abdominal cavity was filled with about 200 c.c. of a thin greenish fluid. The serosa was injected, cloudy, of dirty grayish red color. In the midline of the transverse colon a loop was formed by black silk sutures. Removing these sutures exposed in the anterior

wall of the transverse colon, an irregular opening which measured 11.6 mm. in diameter. The small intestine, and the ascending and transverse colon were markedly distended, while the descending colon, the sigmoid, and the rectum appeared narrow and contracted. The stomach was much dilated by gas and fluid.

Heart, lungs, and liver were negative. Kidneys were swollen and soft. The stomach contained a small amount of a viscid grayish fluid. The mucosa was pale gray and smooth. The small intestine and the upper portion of the colon were filled by a dark green semi-liquid mass. The wall was slightly thickened, and the mucosa was edematous and pale gray in color. In the lower colon the content consisted of a grayish white elastic mass which formed a solid cast and filled the lumen completely. This mass could be easily peeled out and appeared as a cylinder 5 mm. in diameter (Fig. 1). By cutting, small greenish areas were found embedded in a grayish white, slightly translucent substance. The cast terminated in the region of the splenic flexure, at the greenish mass which filled the upper colon, and greenish streaks were seen extending into it. The lower border of the cast was found about 1 cm. above the anus. The mucosa of the lower colon was pale yellowish gray and showed minute yellowish white areas.

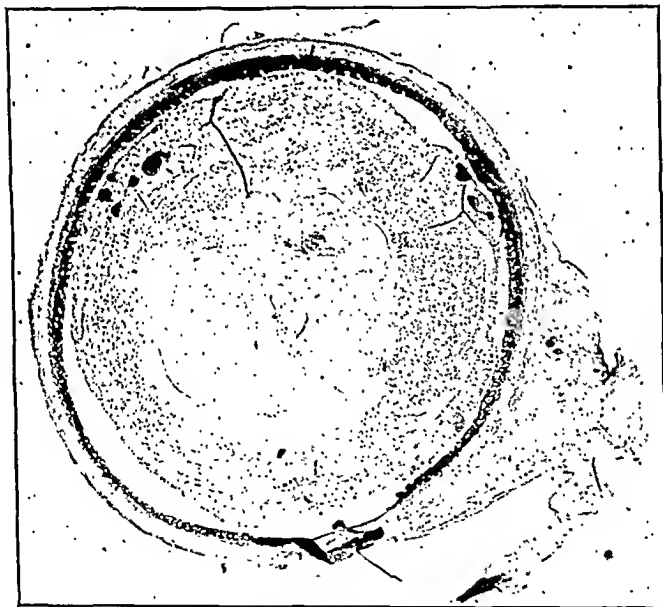


Fig. 1.—Descending portion of colon. Magnification 10 times. The lumen is completely filled by a mucous cast which shows a distinct lamination and inclusions of meconium. The mucosa is compressed.

Anatomic Diagnosis.—(1) Mucous colitis with complete occlusion of the descending colon, sigmoid colon, and rectum by mucous cast; (2) perforated stercoral ulcer in the middle of the transverse colon, recently sutured; (3) diffuse peritonitis; (4) fatty degeneration of the liver, with marked erythro- and granulopoiesis; (5) acute congestion of the spleen; (6) congestion and cloudy swelling of the kidneys, and (7) recent laparotomy wound.

HISTOLOGIC REPORT

1. Colon.—(a) Ascending portion (Fig. 1): The glands of the mucosa were markedly distended. The distention affected chiefly the central half of the glands. Thus, funnel-shaped structures were the result. The lining epithelium of the glands contained numerous goblet cells and there were glands in which the epithelium was formed only by them. There was a limited number of mitotic figures. The neck and the mouth of the glands were filled with pale stained

shreds. The stroma about the glands showed dilated capillary blood vessels and numerous eosinophile leucocytes. Some of them had a single round nucleus. The content of the intestine consisted of a finely granular mass which stained very pale. Under high power magnification a large number of rod-shaped bacteria could be recognized. Embedded with this mass were clumps of hyalin with eosine pinkish stained scales and ovoid hyaline bodies of a brownish color. There were single free cells with distinct nuclei and some with small and pyknotic nuclei. The muscularis showed no changes. The subserous layer appeared loosened and the surface was covered by an enormous number of rod-shaped bacilli which, in places, also invaded the adjacent parts of the subserosa. There was no reaction to the bacterial invasion.

(b) Transverse portion: The findings were similar to those of the ascending part. The surface of the mucosa was covered with a continuous layer of pale-stained shreds which were connected with the material filling the distended glands. The content of the colon contained here very many of the brownish hyaline bodies which were separated in groups by pale-stained shreds.



Fig. 2.—Ascending portion of colon. Magnification 350 times. The center of the field shows a gland the neck and mouth of which are much distended and filled with mucus. The epithelial lining consists chiefly of goblet cells.

(c) Descending portion close to the splenic flexure (Fig. 2): The mucosa was compressed and the outlines of the glands were tortuous. The goblet cells were still predominating. The stroma showed very many eosinophile leucocytes which often formed groups. The content showed a distinct separation into three layers. The center was composed of whirls of pale-stained shreds between which were found single groups of hyaline bodies. Then followed a narrow band made up of many cells which were flattened and had pyknotic nuclei. The outermost layer showed very many hyaline acidophilic and brownish bodies.

(d) *Sigmoid*: The dilatation of the lumen was most marked here and the mucosa was compressed to a narrow layer. Eosinophile leucocytes were less numerous. The content showed the same separation as in the descending part.

2. *Liver*.—The liver cells throughout the acini were filled with medium-sized fat droplets. The portal capillaries were dilated and contained numerous islands of round, dark, nucleated cells. These cells had a narrow oxyphilic or polychromatophilic cytoplasm and their nuclei showed a very dense network of chromatin. In some of the cells the chromatin formed a solid clump. The Kupffer cells were very much swollen and they appeared as large basophilic bodies with irregularly-shaped

nuclei. There was some erythrophagocytosis. The periportal connective tissue was very cellular. There were large round cells with a basophilic cytoplasm and round nuclei with a loose chromatin network. Some cells were filled with a coarse oxyphilic granulation, others contained very fine neutrophilic granules. The oxyphilic cells often formed small groups.

3. *Spleen*.—The pulp was very rich in blood. The sinuses were distended and the cords were compressed to narrow bands. The malpighian bodies were uniformly composed of small lymphocytes. In the periphery of the follicles there were many eosinophilic granulated cells with round nuclei and a few small groups of dark nucleated round cells.

4. *Kidney*.—There was a marked dilatation and engorgement with blood of the capillaries of the medulla.

5. *Thymus*.—The thymus was well developed, showing a medullary and cortical part. There were cells with small fat droplets around the larger blood vessels.

The interesting feature of this case was the perforation of the bowel in connection with the intestinal obstruction caused by the mucous plug. The length of the mucous plug was out of all proportion to that of any similar plug seen in other cases or noted by other writers. The sudden onset of serious symptoms with comparatively little preceding evidence of serious trouble with the baby, is noteworthy. The failure of the nurses and interns to observe and record the lack of stools was an important contributory factor to the fatal outcome. Fortunately, we have been put on our guard by this fatal case and the others that we have seen have survived.

I was asked to see a case in consultation with one of my colleagues who had delivered the baby spontaneously, L.O.A., at 11 A.M., July 12, 1929. The girl baby weighing eighty-six ounces was delivered in twelve hours, and her mother who was a healthy primipara twenty-three years old, had had no illness either before or after pregnancy. A meconium stool was recorded by the nurse at birth but the doctor in charge did not remember it. The next day the baby vomited at 6 A.M. and again at 10 P.M. A mucous stool (amount not given) was recorded at 10 P.M. on July 14, 1929. The abdomen was markedly distended and the skin of the abdomen was tense and shiny. A pediatrician was asked to see the baby. He noted the distention of the abdomen and thought he could detect some peristaltic waves. No rectal obstruction was noted on insertion of the catheter; some gas escaped. Enema result was a small amount of white mucus. About three hours later in the day the abdomen was markedly distended, tense, and shiny; the baby was in distress. The baby vomited three times before three o'clock and the vomitus contained bile but no blood. I saw the baby at 3:30 P.M. and inserted a well-oiled thermometer as far as it would go without forcing. I did this very gently on various sides of the bowel. The baby passed a typical mucous plug, about 3 cm. long, at 6 P.M. It had another emesis at 7:30 P.M., another at 8:30 P.M., and again at 11:20 P.M. Following this the baby had a good night's sleep. She vomited once the next morning but also had a good bowel movement containing much mucus. The distention, disappeared and she made an uneventful recovery.

We have seen 3 other cases since the occurrence of the first one noted above, which have given some evidence of intestinal obstruction. On examination they were all found to have obstruction in the lower bowel caused by inspissated mucus. The diagnosis, in each case, was

made early, before the baby had developed any marked distention and before vomiting and cyanosis had developed. Inserting the oiled thermometer resulted in the expulsion of the plug within a few hours in all cases.

This has led to an order to the interns and resident physicians to examine the rectum and test for patency in all infants born in our clinic, and to the nursery nurse to report to the supervisor any child that does not have a good meconium stool within twelve hours after delivery, whether the baby appears sick or not.

DISCUSSION

The etiology of this condition is obscure. Landsteiner¹ found in a fatal case a marked fibrosis of the pancreas which he felt probably altered the secretion of this organ and gave rise to the altered condition of the meconium in the bowel.

A. Fischer,² on the other hand, describes a case in which he believed that changes in the liver resulting in abnormal bile formation and extrusion into the bowel lumen resulted in the collection of meconium and inspissated mucus that blocked the bowel.

As to the rupture of the bowel and its pathogenesis there is also no definitely accepted view. Paltauf³ and Rüdne⁴ have come to the conclusion that the perforation occurs through a false diverticulum which occurs at a weak place in the bowel wall produced by a thrombosis of a vessel perforating the muscle coats of the bowel wall.

Zillner⁵ reports 4 cases of spontaneous rupture of the sigmoid flexure in newborn infants without associated obstruction or diverticulum formation.

The mode of production of the mucous plug in our fatal case is not clear nor is the pathogenesis of the perforation of the bowel evident. The liver showed no changes comparable with those in the case described by Fischer. Unfortunately, the pancreas was not studied, so we do not know whether or not the findings described by Landsteiner were present.

TREATMENT

Treatment depends on the type of case and on the time at which the diagnosis is made. All babies should be inspected carefully and routinely at birth for the presence of obstruction in the lower bowel. Clinical charts should be carefully examined in the first few days of the baby's life to see whether normal meconium stools are being passed. The cases may be divided into two classes. The first includes those with a relatively short mucous plug attached to the wall of the rectum. Minor measures will be sufficient or spontaneous expulsion may be expected in this class of case. If obstruction is present, a well-oiled clinical thermometer should be gently inserted into the rec-

tum and attempts made to loosen the plug from the wall of the bowel by gently insinuating the thermometer between the plug and the bowel wall at several points. This usually results in the baby's expelling the mucous plug within a few hours, followed by complete relief of symptoms.

The second group is that in which an extensive mucous plug is in a part of the bowel not accessible except by operation. In this class of patient a laparotomy should be done as soon as the symptoms of intestinal obstruction become pronounced. The plug of mucus may be high up in the colon or even at the ileocecal valve and lower ileum. Operation should not be delayed until the child is moribund. It is probable that the uniformly fatal results that have followed operations in these cases, would be improved if early intervention were practiced. If operation is undertaken for obscure obstruction, it would seem from the reports thus far submitted that the place most likely to be obstructed is the sigmoid flexure of the large bowel and the next most frequent site is the region of the lower ileum and ileocecal valve.

REFERENCES

- (1) *Landsteiner*: Zentralbl. f. Allg. Path. u. Path. Anat. 16: 903, 1905. (2) *Fischer, A. E.*: Am. J. Dis. Children 36: 774, 1928. (3) *Paltauf*: Virchow's Arch. 111: 1888. (4) *Rudneu*: In Aug. Dissert. Basil. (5) *Zillner*: Virchow's Arch. 96: 1884.

Lee: Weights and Measurements of the Chinese Newborn. National Med. J. China 16: 707, 1930.

The average weight of the Chinese newborn, irrespective of sex, is 3052 grams. Male infants tend to weigh more than female infants, the average weights being respectively 3,124 grams and 2,980 grams. Children born of Southern parents tend to weigh more than those born in Central China and babies born in the North are still less heavy. The birth weight increases directly with the parity of the mother up to the birth of the 4th child and thereafter is somewhat diminished. It is also found that the size of the infant tends to increase with the age of the mother at the time of birth. The diameters of the full term Chinese fetal skull are somewhat smaller than in the case of full term American infants.

C. O. MALAND.

ACUTE LYMPHATIC LEUCEMIA COMPLICATING PREGNANCY*

BY BERNARD MANN, M.D., F.A.C.S., PHILADELPHIA, PA.

ACUTE lymphatic leucemia is a very rare complication of pregnancy. Wm. Allen reporting a case recently states that less than six cases have so far been reported.

M. S., white, twenty-three years of age, was admitted to the Northern Liberties Hospital, September 22, 1928, in labor. Fever, marked weakness, pain and edema of the lower extremities, cough, bloody expectoration, and headache. Her membranes had ruptured two hours prior to admission.

Menstrual history was normal. The last period occurred on February 6, 1928. She had three children, the last one eleven months old. She had influenza eight years ago and again nine months ago. During this pregnancy, she suffered from headache, vertigo, black spots before the eyes, edema of the legs, frequency of urination, night sweats, and some loss of weight.

The physical examination revealed an undernourished young female, flushed face, apparently in fever and in labor. The teeth were in very bad condition. Heart sounds were rapid and weak, but clear. Blood pressure was 100 over 60. Lungs were clear. Lower extremities were somewhat edematous. There was no evidence of glandular enlargement. The abdomen was enlarged and the uterus was the size of about a seven months' pregnancy. Uterine contractions were noted. Fetal heart sounds could not be heard. The spleen could not be felt.

On pelvic examination the cervix was found dilated about three fingers, the vertex presenting and the membranes ruptured. There was a moderate amount of brownish discharge which was very offensive.

She delivered herself of a living, male baby, weighing five pounds, seven hours after admission.

The acute symptoms began eight days before admission; manifested by fever reaching 104°, weakness, pains in the lower extremities, and headache. Her physician diagnosed the condition as influenza. On admission to the hospital, her temperature was 102°, pulse 120, and respirations 22. Two hours after her delivery she got out of bed, was irrational, and was with difficulty, restrained and kept in bed. She then had a severe postpartum hemorrhage. Pulse 140, temperature 104°. Eight hundred c.c. of normal saline was given intravenously. Pituitrin and ergot controlled the bleeding.

The uranalysis showed a heavy trace of albumin; no sugar; few granular and hyaline casts, many W. B. C. and R. B. C. Blood examination: R. B. C., 3,000-100; W. B. C., 4,800; hemoglobin, 55 per cent; polynuclears, 21 per cent; small lymphocytes, 79 per cent.

At this time it was thought that the nature of the infection might be pneumonia. This was suggested by the bloody expectoration and the moderately high fever which tended to be continuous, but the absolute absence of pathology in both lungs on physical examination and negative x-ray findings of the chest ruled it out. For the same reason pulmonary tuberculosis was eliminated, although she had bloody expectoration, loss of weight, and night sweats.

The marked leucopenia helped to uphold a diagnosis of influenza or typhoid fever, although the percentage of lymphocytes was unusually high.

*Reported before the Philadelphia Obstetrical Society, February 7, 1929.

On September 24, 1928, the blood picture changed considerably. Hemoglobin, 40 per cent; large lymphocytes, 50 per cent. She was given 450 c.c. of blood by transfusion, which did not improve her condition. She continued in a toxic state, elevated temperature, and pulse, dry tongue, etc. Many ecchymotic spots were noted on her chest, upper extremities and mouth, varying in size from a pinhead to the size of a silver quarter.

This finding together with the high percentage of lymphocytes suggested a diagnosis of acute lymphatic leucemia in spite of the absence of any glandular enlargement.

This diagnosis also explained the symptoms of hemorrhage from the lungs and into the skin, the fever and probably the uterine hemorrhage.

The blood culture and Widal were negative. Blood Wassermann was 2-plus. A blood count showed hemoglobin, 35 per cent; R. B. C., 1,730,000; W. B. C., 17,800; Poly 3 per cent; small lymphocytes, 6 per cent; large lymphocytes, 91 per cent.

She was again transfused, 400 c.c. of blood being given.

The temperature remained high, reaching almost 105°, the pulse rate continued 150 and over. She developed a diarrhea which continued until her death. Toward evening she became restless and delirious, and had a severe chill which lasted for five minutes, and she died at 11:25 A.M., Sept. 27, 1928.

REPORT OF AUTOPSY

Female about twenty-three years old. Development of skeleton was normal. General nutrition poor. The skin presented scattered early ecchymotic spots varying in size from a pinhead to a silver quarter in diameter. Similar discoloration is observed on the mucous membrane of the mouth. The superficial lymph glands are not enlarged.

The abdominal cavity was free from fluid or gas, but the peritoneum, both parietal and visceral, was studded with minute hemorrhagic spots. The mesenteric lymph nodes were not enlarged. There was no evidence of inflammation or ulceration along the gastrointestinal tract, except the minute hemorrhagic spots which could be seen through the peritoneal covering. The liver was much larger than normal, weighing 1970 gm. (normal 1600 gm.). It was rather pale; its surface was smooth, its capsule not thickened or adherent. A few hemorrhagic spots were seen through the capsule.

The spleen was nearly twice as large as normal, weighing 370 gm. (normal 200 gm.). It was dark in color, smooth surface, its capsule was not thickened or adherent. The trabeculae were less numerous than in the normal spleen. There was hardly any differentiation between splenic pulp and nodule, the latter was evidenced in many instances only by the splenic artery around which collected a few deeply staining lymphocytes. The entire specimen was filled with small lymphocytes in a diffuse and disorderly arrangement. Red blood cells were seen scattered among the lymphocytes. Here and there minute areas of necrosis were seen. The main feature of the specimen was the overflowing of the lymphocytes from the nodules into the pulp, obliterating thereby the normal histology of the spleen.

Both kidneys were slightly enlarged, weighing 200 gm. each. The capsule could be stripped off easily. Minute ecchymotic spots were seen through the capsule and also in the kidney substance on cross-section. The specimen presented evidence of cloudy swelling, the cells lining the tubules being large and granular. Occasional collections of small lymphocytes were present. Microscopic hemorrhages were seen.

The pancreas was about normal in size, shape, and appearance.

The pleural cavities were free from gas, fluid, or adhesions.

The pericardium presented many ecchymotic spots and contained about 6 c.c. of straw-colored fluid.

The heart was normal in size, weighing 250 gm., its chambers containing a grayish clot. The valves were free from lesions. Specimen presented a rather marked infiltration with lymphocytes, the latter were not present in large collections, but rather in small groups between the muscle fibers, in many instances the lymphocytes were seen between the muscle fibers in single files.

The uterus was about the size of a grapefruit, soft, and boggy. The specimen presented areas of necrosis and was rather densely infiltrated with small lymphocytes.

The lungs presented no evidence of pneumonia or tuberculosis.

The mediastinal glands were not enlarged.

The brain, spinal cord, and bones were not examined because of restrictions accompanying the permission for autopsy.

The presence of small hemorrhages over the peritoneum, pericardium, the kidneys, the large spleen and liver, together with the microscopic findings and the blood picture, were conclusive evidences that this is a case of acute lymphatic leucemia.

1309 SPRUCE STREET.

JOHN STEARNS AND PULVIS PARTURIENS

BY HERBERT THOMS, M.D., F.A.C.S., NEW HAVEN, CONN.

THE story of ergot is a dramatic chapter in medical history. This fungous growth has the distinction of being in the past the cause of one of the greatest scourges mankind has known, and at the present time a therapeutic agent of life-saving importance.

Ergot (*Claviceps purpurea*) is a fungous growth obtained almost exclusively from the cereal grain rye. The word is derived from the French "argot," "the spur of a cock," which the growing fundus somewhat resembles. It has probably been known from earliest times. We learn that an Assyrian tablet about 600 B.C. alludes to a "noxious pustule in the ear of grain," and in one of the sacred books of the Parsees (400-300 B.C.) there occurs this passage: "Among the evil things created by Angro Maynes are noxious grasses that cause pregnant women to drop the womb and die in childbed.

It was not until the close of the seventeenth century that ergot became recognized as the cause of a pestilential disease which had ravaged the human race for centuries. Ergotism was variously known as St. Anthony's Fire, Ignis Sacer, and Ignis Inferius, and was due to the ingestion of ergotized grain.

The history of ergot as a therapeutic agent is in its beginnings somewhat obscure. Wellcome¹ tells us that Camerarius in 1688 writes of its use in certain parts of Germany to accelerate parturition. In 1774, M. Parmentier mentions in a letter that powdered ergot is used in slow labor, and in 1777, a surgeon of Lyons, Desgranges, published observations concerning the use of spurred rye in lingering labor.

Medical historians, however, are quite agreed that the chief credit for the introduction of ergot in scientific obstetrics is due to Dr. John

Stearns, an American physician born in Wilbraham, Massachusetts, May 16, 1770, and who died in New York City, March 18, 1848. A brief story of the discovery and the discoverer should have interest to American obstetricians because the former definitely belongs to American obstetrics and the latter was one of the great influences, particularly in New York State, for the betterment of American medical practice.

Of the boyhood of John Stearns, but little is known. He graduated from Yale College with distinguished honor in 1789, and began his preparation for medical practice with Dr. Erastus Sergeant, of Stockbridge, Massachusetts. Dr. Sergeant was one of the leading men of



JOHN STEARNS

his time. He had had a distinguished career in the Revolution as an Army surgeon, and was one of the eminent operators of his day. After two years, Stearns went to Philadelphia, where he attended the lectures of Shippen, Wistar and Rush. It will be noted that both in liberal arts and medicine this young doctor received probably as fine educational facilities as the country then afforded. In 1793, Stearns began to practice medicine near Waterford, in the county of Saratoga, New York. The influence of his ability and education must soon have been felt, for in 1805, when the Medical Society of the State of New York was founded, we are told by Williard² that the leading spirit in the enterprise was Dr. John Stearns, of Saratoga County. He was elected secretary at this first meeting, and continued in this important office for many years. It was in 1807 that the first of his notable con-

tributions on ergot appeared.³ In a letter dated at Waterford, January 25, to Dr. S. Ackerly, he wrote the following:

"In compliance with your request I herewith transmit you a sample of the pulvis parturiens, which I have been in the habit of using for several years, with the most complete success. It expedites lingering parturition, and saves to the accoucheur a considerable portion of time, without producing any bad effects on the patient. The cases in which I have generally found this powder to be useful, are when the pains are lingering, have wholly subsided, or are in any way incompetent to exclude the fetus. Previous to its exhibition it is of the utmost consequence to ascertain the presentation, and whether any preternatural obstruction prevents delivery; as the violent and almost incessant action which it induces in the uterus precludes the possibility of turning. The pains induced by it are peculiarly forcing; though not accompanied with that distress and agony, of which the patients frequently complain when the action is much less. My method of administering it is either in decoction or powder. Boil half a drachm of the powder in half a pint of water, and give one-third every twenty minutes until the pains commence. In powder I give from five to ten grains; some patients require larger doses, though, I have generally found these sufficient.

"If the dose is large it will produce nausea and vomiting. In most cases you will be surprised with the suddenness of its operation; it is, therefore, necessary to be completely ready before you give the medicine, as the urgency of the pains will allow you but a short time afterward. Since I have adopted the use of this powder I have seldom found a case that detained me more than three hours. Other physicians who have administered it concur with me in the success of its operation.

"The modus operandi I feel incompetent to explain. At the same time that it augments the action of the uterus, it appears to relax the rigidity of the contracted muscular fibers. May it not produce the beneficial effects of bleeding without inducing that extreme debility, which is always consequent upon copious depletion? This appears to be corroborated by its nauseating effects on the stomach, and the known sympathy between this viscus and the uterus.

"It is a vegetable, and appears to be a spurious growth of rye. On examining a granary where rye is stored, you will be able to procure a sufficient quantity from among that grain. Rye which grows in low, wet ground, yields it in greatest abundance. I have no objections to your giving this any publicity you may think proper."

Accordingly, in 1807, in the eleventh volume of *The New York Repository* the "proper publicity" was given. Like most great innovations in medicine, the start was inconspicuous, and it was not until several years had passed that the importance of the discovery awakened a controversial response of ardent and vehement character. This was due in large measure to certain poor results, which accompanied the administration of the drug indiscriminately in labor. In passing, it is interesting to observe that we have been through in recent years an identical experience with pituitrin, and it appears that this therapeutic agent also must go through a considerable time cycle before knowledge of its proper administration becomes universal.

A noteworthy champion in the cause of ergot is found in Oliver Prescott,⁴ of Massachusetts, who gave a scholarly dissertation on the subject before the Massachusetts Medical Society on June 2, 1813. He alludes particularly to the frequency of fetal death associated

with the improper administration of ergot, and points out the great value of this drug in uterine hemorrhage.

He writes: "It is also too active and powerful an agent, to be safely directed by an ignorant or unexperienced accoucheur; and before dismissing the subject, I most cordially join in cautioning those, who have not been in the practice of using it, and witnessing its operations, to be wary how they employ its agency, until the muscular fiber is properly relaxed, and the *os uteri* considerably dilated. This caution is also more especially necessary, if they are not positively certain that the presentation is natural, as well as 'that there are no preternatural obstructions to prevent delivery; as the violent pain, and almost incessant action, which it frequently induces, in the uterus, precludes the possibility of turning' the fetus.

"The tendency of its operation is, I conceive, to constrict the uterine fibers, and lessen the caliber of its blood vessels; for when given to parturient patients, there has been no instance, within my knowledge, of undue hemorrhage after delivery, although several, who have taken it, have been previously accustomed to profuse discharges. The lochia also, have occasionally been so much diminished, after its use, as to excite apprehension for the event. In two cases, this discharge entirely ceased, on the second or third day after delivery, and did not reappear during the month; but no puerperal complaint was induced, nor was their recovery delayed by this incident.

"The uniform operation of the ergot to restrain uterine hemorrhage, has been noticed by other physicians. It has in consequence, frequently been prescribed, a little previous to the birth of the child, or immediately after, to patients who have been accustomed to flow immoderately, at such times, and it has always proved an effectual preventive."

Many of Stearns's contemporaries, however, were not of so favorable an opinion. We find that the versatile pharmacopeist, Lyman Spalding⁵ was disappointed both in the efficacy of the drug and in his ambition to become a great obstetrician. In a letter to William Hammersley, he suggested that "a dozen doses of ergot and an equal number of papers containing the same quantity of ground coffee" be prepared. These were to be given at random by the nurse in a certain number of cases, and after explicit directions for carrying out this unique experiment, the author concludes, "When his" (i.e., the doctor's) "twenty-four powders are all used let him read his remarks on his twenty-four cases and if he have not recorded as wonderful effects from the use of twenty grains of coffee when the *os tincae* was dilated to the size of a dollar as from the use of a like quantity of ergot, certainly the article was not genuine or it has failed to produce its usual effects when administered by your most obedient and humble servant. L. Spalding."

In 1882, however, the advantages of ergot in obstetrics were firmly established in a masterly essay by the discoverer, John Stearns.⁶ This was "Observations on the *Secale Cornutum*, or Ergot, with directions for its use in Parturition." Owing to lack of space, it is not possible to reproduce in toto this epoch-making contribution. A few

extracts may serve, however, to whet the appetite of the reader to peruse the entire essay. I can assure him that he will be amply repaid for his effort.

"It was not till the year 1807," writes Stearns, "that the ergot ever appeared before the public in a form to arrest the attention of medical men. Some years previous to this, I was informed of the powerful effects produced by this article, in the hands of some ignorant Scotch woman, in the county of Washington. Determined to try its efficacy, I procured a quantity from a field of rye. My information was such as to impress upon my mind the necessity of extreme caution in my first experiments. The continued influence of this impression upon my subsequent practice, has been a source of much consoling reflection. It has tended to prevent those fatal errors which have so often occurred, and which, I trust, will be satisfactorily explained in the ensuing remarks. . . .

"The publication of my letter to Dr. Ackerly, in 1807, produced an immense number of applications from remote practitioners. I immediately forwarded to each samples of the ergot, with directions for its use. . . . The success of the ergot is in no case more evident than in the selection of a suitable time of its exhibition. Although often given to procure abortion, it does not appear to have succeeded. It also generally fails to complete success when given in the early stages of labour, and before the os uteri is sufficiently dilated and relaxed. . . . I will now proceed to consider those indications which render its exhibition necessary and important.

"The ergot is indicated, and may be administered,

"I. When, in lingering labours, the child has descended into the pelvis, the parts dilated and relaxed, the pains having ceased, or being too ineffectual to advance the labour, there is danger to be apprehended from delay, by exhaustion of strength and vital energy from haemorrhage or other alarming symptoms.

"II. When the pains are transferred from the uterus to other parts of the body, or to the whole muscular system, producing general puerperal convulsion.

"III. When in the early stages of pregnancy, abortion becomes inevitable, accompanied with profuse haemorrhage and feeble uterine contractions.

"IV. When the placenta is retained from a deficiency of contraction.

"V. In patients liable to haemorrhage immediately after delivery. In such cases the ergot may be given as a preventive, a few minutes before the termination of the labour.

"VI. When haemorrhage or lochial discharges are too profuse immediately after delivery, and the uterus continues dilated and relaxed without any ability to contract.

"I have thus exhibited a general view of the errors often committed in prescribing ergot, of the unfavourable results of such practice, of those cases in which it never ought to be administered, and of the indications which render its exhibition necessary and important. These remarks are derived from actual experience in several hundred cases, and are confirmed by those whose observations have been the most extensive and correct. While there is reason to suspect the influence of prejudice upon the minds of some who oppose its use, their own statements generally admit their very limited opportunities for witnessing its effects, and in some instances, while using it in their first experiments, on which their opinions were founded, that they grossly deviated from every direction calculated to ensure success.

"While the frequent occurrence of such abuses is to be deplored, much satisfaction may be derived from this reflection, that a prudent and judicious use of this article has in a great variety of instances contributed to save the lives of the mother and child. That such will continue to be its effects when directed by a dis-

erect, judicious, and experienced practitioner, we have the most satisfactory reason to infer from past experience, and from the peculiar properties and operation of the ergot.''

A perusal of the life of Dr. John Stearns, the discoverer of ergot, reveals at once that he was a man from whom great things could be expected. With his fundamental culture, he developed his talents to such a degree that his life is marked with noteworthy achievement. Only the briefest survey of the life of John Stearns is possible, yet such a survey shows at once his caliber.

His extraordinary ability as secretary of the Medical Society attracted attention, and in 1809 he was elected a senator in the State of New York, serving four years. In 1812, the regents of the University conferred upon him the honorary degree of M.D. In 1817, he was elected President of the State Medical Society, and was subsequently reelected for three succeeding terms. In 1810, he removed to Albany, and nine years later to New York City, where the remainder of his life was spent. In the latter place, he became prominent as a consultant, and contributed largely to the medical periodicals of that day. When the New York Academy of Medicine was organized in 1846, the honor of being the first president fell to Dr. Stearns, then seventy-five years of age. Four years later, he died of septicemia from a dissection wound received while performing an autopsy. That the value of Stearns's discovery was known and appreciated by his contemporaries is well shown by the testimony of Dr. William Tully,⁷ one-time Professor of Materia Medica in the Yale Medical School, who wrote: "As it was reserved however for the illustrious Jenner to investigate and promulgate to the world the important discovery of vaccination, so it has fallen to the lot of our countryman Dr. Stearns, first to search into and ascertain by experiment; to reduce to scientific form and make public the powers of the Clavus, and at the same time, to prescribe the true restrictions, and limitations which should always regulate its use."

REFERENCES

- (1) *Wellcome, H. S.*: From Ergot to Ernatin. Lecture Memoranda, A. M. A., Chicago, 1908. (2) *Williard, S. D.*: Annals Med. Soc., County of Albany, 1806-51 (quoted by Walsh, J. J.). (3) *Stearns, J.*: N. Y. Med. Repository 11: 1807. (4) *Prescott, O.*: Dissertation on Ergot. Annual Meeting Mass. Med. Soc., June 2, 1813, Boston, Publ. by the Society. (5) *Spalding, L.*: U. S. J. Med. Surg. 8: 145. (6) *Stearns, J.*: Med. Rec. 5: 666, 1822. (7) *Tully, Wm.*: Am. J. Sc. & Arts 2: 45, 1820.

REFERENCES ON THE LIFE OF STEARNS

- (8) Transactions of A. M. A. 3: 1850. (9) *Walsh, J. J.*: N. Y. State J. Med. 8: 197-377, 1908. (10) *Kelly and Burrage*: American Medical Biographies, Baltimore, p. 1091, 1920.

NEW HAVEN HOSPITAL.

PRIMARY CARCINOMA OF THE FALLOPIAN TUBE, WITH A REPORT OF TWO CASES*

BY BROOKE M. ANSPACH, M.D., AND JACOB HOFFMAN, M.D.,
PHILADELPHIA, PA.

(From the Department of Gynecology, Jefferson Medical College Hospital)

PRIMARY carcinoma of the fallopian tubes is listed by Stübler and Brandes as forming 0.45 per cent of all genital cancers. An approximate idea of its incidence is shown by the fact that it occurred once in 19,439 gynecologic cases at the University Hospital in Philadelphia; five times in 35,000 cases at the Johns Hopkins Hospital, Baltimore; three times in 30,000 at the Bellevue Hospital, New York; and once in 4,275 cases admitted to the gynecologic service of the Jefferson Hospital since 1922.

Notwithstanding its rarity one is interested to note that within the experience of a group of men primary carcinoma of the tube may be relatively frequent. For example, Wharton and Krock, reported a series of 14 cases, of which five occurred at the Johns Hopkins Hospital, the remainder at neighboring hospitals, and one of us has had two cases, during the last three years. In November, 1929, Wharton and Krock estimated that 230 cases had been recorded up to that time. Since then, additional cases have been reported by P. Y. Kolartchouk (two cases); R. E. Watkins and W. M. Wilson (one case); and P. Klein (one case, associated with tuberculosis of the tube); to these we wish to add two, bringing the total up to 236. We shall not discuss the etiology, pathology, symptomatology or treatment of primary carcinoma of the tube, except to point out that in both of our cases an intermittent bloody serous discharge was the outstanding feature. In a woman past the menopause this is a significant symptom. Wechsler's summary of 53 postlimacteric cases in 1926 shows that a bloody discharge was present in more than half of those beyond the reproductive period.

The diagnosis of the disease in the early stage is difficult to make, but a careful observation of the patient and the exclusion of other sources of hemorrhage will be of much value. Those interested in the subject are referred to the many excellent papers that have been written, especially those of Wechsler and of Wharton and Krock.

The purpose of the present communication is to place two cases on record.

*Read before the Obstetrical Society of Philadelphia, January 9, 1931.

CASE 1.—E. W., aged sixty-four, consulted us in September, 1928, stating that, after a five-day motor trip she had experienced slight pain in the right lower abdomen, which was followed and relieved by a watery and bloody leucorrhea. The patient had married at the age of forty-three; there had been two labors, and one abortion at six weeks. The menstrual periods were regular until the menopause at fifty-two. The patient's general health was excellent, her weight varying between 150 and 160 pounds.

Pelvic examination showed a marked relaxation of the vaginal outlet; a little pinkish discharge was observed in the vagina. The uterus was small and slightly in descensus. The abdomen was fat and definite palpation of the adnexa difficult. No blood was seen in the cervix, even after vigorous palpation.

The patient was examined at frequent intervals but it was not until more than two weeks after the initial visit that blood was detected coming from the cervical canal.

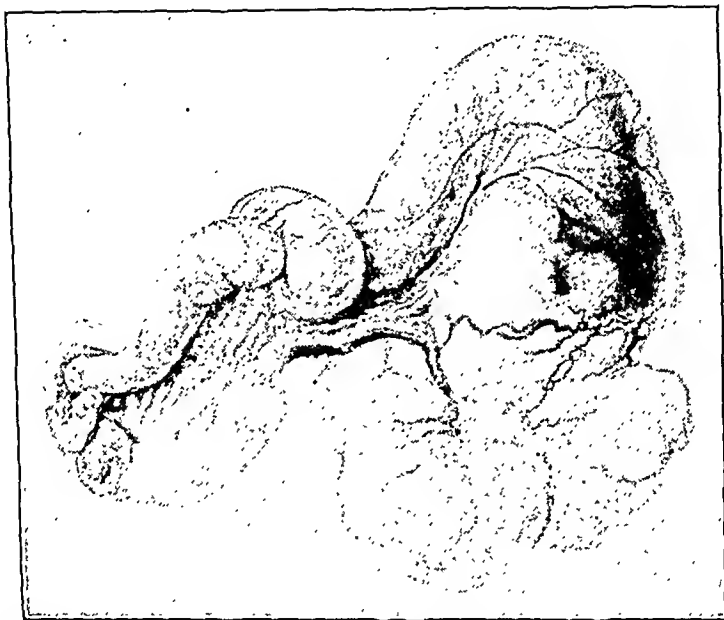


Fig. 1.—Primary Carcinoma of the right tube. Small atrophic ovary not involved. Pelvic examination: Tubal enlargement on the right side, suspected but not positive. Exploratory section. (From Anspach's *Gynecology*, J. B. Lippincott Co., Philadelphia.)

The patient was much opposed to any operative procedure, but after urging, she consented to a diagnostic dilatation and curettage. This was performed on October 5, 1928. The endometrium was quite atrophic; pelvic examination under anesthesia discovered no enlargement of the uterus or adnexa; periodic discharge of bloody fluid from the uterus recurred within the month. A second curettage and the removal of a few small polyps from the cervical mucosa was done January 11, 1929; the periodic discharge continued.

About six weeks later, there developed an ill-defined enlargement of the right tube and ovary. When exploratory section was suggested, the patient recalled that as a young unmarried woman a diagnosis of right adnexal enlargement had been made and an operation for the removal of the pelvic organs had been suggested. Later, after her marriage at the age of forty-three, on the basis of the same findings, she was told that it would be impossible for her to conceive. Despite this opinion, she conceived almost immediately. She had acquired, as a result of these experiences a skeptical attitude toward surgical intervention. This was overcome later, April 19, 1929, when repeated pelvic examinations had disclosed a

definite progressive enlargement of the right adnexa and a small nodule on the anterior surface of the uterus.

On opening the abdomen, examination of the pelvic viscera disclosed a carcinomatous growth involving the right tube and ovary. Metastatic nodules were found in the pouch of Douglas, beneath the right vesicocervical reflection of the peritoneum and in the wall of the sigmoid at the pelvic brim.

The operation consisted of a supravaginal hysterectomy, bilateral salpingo-oophorectomy, and partial excision of the metastatic nodules. Deep x-ray treatments were given after the wound had healed. The patient died seven months after the operation.

Pathologic Report.—*Gross:* The specimen consists of the uterus and right adnexa. The uterus is small and atrophic; the tube and ovary although senile are normal throughout.

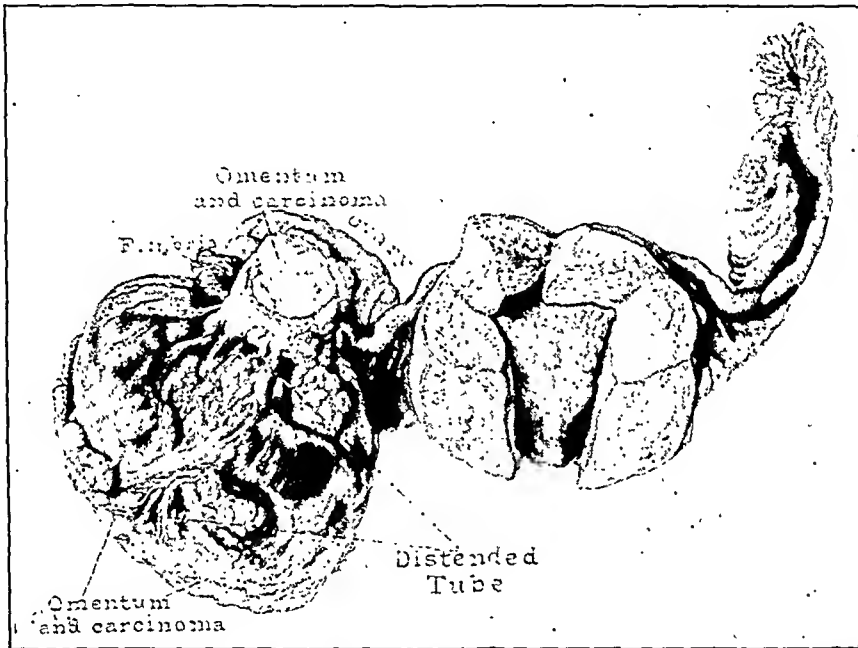


Fig. 2.—Primary Cancer of the right tube. Possibly became hopeless during course of observation. Pelvic examination: at first negative; stout woman. At operation extension to omentum and to sigmoid; enlarged glands in the mesentery of the sigmoid. (From Anspach's *Gynecology*, J. B. Lippincott Co., Philadelphia.)

The right tube up to its middle third (a distance of $2\frac{1}{2}$ cm.) appears normal. It then becomes markedly thickened and forms a firm, irregular, sausage-shaped enlargement measuring $6\frac{1}{4} \times 3\frac{1}{2}$ cm. The fimbria are seen at the outer extremity in close approximation to the ovary. There are many nodular omental adhesions. Here and there small papillary, nodular excrescences are seen. A firm, grayish-yellow nodule partly covered by omentum, measuring 2 cm. in diameter, is seen upon the superior aspect of the tumor and closely adherent to the ovary.

The ovary is closely attached to, and forms a part of the adnexal mass which measures $6\frac{1}{4} \times 5 \times 3\frac{1}{2}$ cm. but the ovary itself is not increased in size. The color of the tumor varies from a purplish-red to a grayish-yellow. The uninvolvement part of the tube forms a pedicle uniting the tubal mass to the uterus.

Microscopic: Tube: Section through the tube wall, including the tumor mass, reveals an advanced carcinomatous growth which involves almost the entire mucosa and has a distinct tendency to grow lumen-wards. Only a few well-preserved tubal

plicae are seen. Many papillary masses, consisting of a slim degenerated core, and covered with layers of epithelium of the cylindrical variety, extend into the lumen of the tube. The fusion of these papillae results in the formation of alveolar-like structures. Numerous solid islands of carcinoma cells exhibiting a variation in their size and shape, are present. Mitosis, polynucleosis and hyperchromatosis are noted. Very little of the normal stroma remains, most of it being replaced by large necrotic areas surrounded by dense polymorphonuclear and round cell infiltration. In one area, the epithelial cells are seen breaking through the basement membrane and beginning to infiltrate the muscularis. Most of the muscular coat seems to have escaped this carcinomatous process.

Right Ovary: The ovarian stroma is infiltrated by an alveolar growth, resembling that of the tube.

Peritoneum: Shows the same picture as the growth found in the tube and ovary.

Diagnosis: Primary papillary alveolar carcinoma of the right fallopian tube, with metastases to the right ovary and the peritoneum.

CASE 2.—Miss A. F., single, aged seventy-three, was first observed October 28, 1929. She complained of a bloody leucorrhea. At its beginning, three months before, the vaginal discharge had been white; later it had become yellow and finally, three weeks before, bloody.

Menstruation had been regular until the approach of the menopause, twenty-six years before, at the age of forty-seven when for a while there had been some menorrhagia. Her general health was good, except for hypertension. Her weight had not changed within the last five years.

Pelvic examination revealed a senile vaginitis; there was a small amount of a serosanguineous discharge in the vaginal vault. No blood, however, was seen coming from the cervix. The uterus was atrophic, and in normal position. The abdomen was fat and the adnexa at that time were not palpable.

Diagnostic curettage, October 29, 1929, disclosed a small uterine cavity. The endometrium was atrophic; malignant disease of the uterus was excluded.

The blood-tinged, watery discharge continued despite relief of the vaginitis with local therapeutic measures. The patient was kept under close observation. Pelvic examination at a later date following a vigorous palpation of the uterus disclosed dark blood coming from the external os. An enlargement of the right tube and ovary was suspected.

On February 1, 1930, a laparotomy was performed. Examination of the pelvic viscera revealed a nodule about the size of an English walnut in the outer third of the right tube. The outer half of the tube was distended with a bloody fluid. The ovary was entirely uninvolved. A right salpingo-oophorectomy was performed. Spinal anesthesia failed; the patient was difficult to relax with gas and ether; there was some difficulty in exposing the pelvic organs. The patient died one week later from adynamic ileus.

Pathologic Report.—*Gross:* The specimen consists of a right fallopian tube and ovary.

The tube is retort shaped, measures $7\frac{1}{2}$ cm. in length, and contains a newgrowth occupying its outer third and projecting from its abdominal ostium; its middle and inner parts are covered with a purplish-red serosa. The thickness of the tube varies from 0.4 cm. at the uterine cornu to 3.5 cm. at the pars-abdominalis. The outer part of the tube is cystic, the inner half is tortuous in appearance and at the middle third is twisted upon itself resembling a knot. The tube rapidly increases in thickness and about the junction of the middle and outer third fuses with a nodular, lobulated, grayish-yellow mass measuring $6 \times 4 \times 3$ cm. The fimbriated end is continuous with this cauliflower-like mass covered with fine papillary excrescences; over the surface there is a network of small blood vessels.

The right ovary is senile, and measures $2 \times 1 \times \frac{1}{2}$ cm. An old corpus albicans is seen at the outer pole. The ovary has absolutely no connection with the nodular mass found at the outer end of the tube.

Microscopic: Tube: Examination of sections from a piece of tissue removed from the nodular surface of the growth reveals that it is composed for the most part of epithelial elements with very little surrounding stroma. There are numerous plump papillary formations, made up of a fibrous core and covered with many layers of epithelium. The outer layers of these papillae show evidence of degeneration. Here and there, long, slender strands of cylindrical epithelium present an elaborate arborescent effect. Solid masses of epithelial cells of the cylindrical variety are seen. The nuclei of the cells are deeply stained and many are undergoing mitosis. In a number of places, small alveolar formations are noted. Extensive areas of degeneration and necrosis appear, especially near the lumen. The muscular coat, although markedly attenuated, presents but slight involvement.

Diagnosis: Primary papillary alveolar carcinoma of fallopian tube.

REFERENCES

- (1) *Auspach, Brooke M.*: AM. J. OBST. & GYNEC. 20: 571, 1930. (2) *Klein, P.*: Zentralbl. f. Gynäk. 53: 1810, 1929. (3) *Kolarchouk, P. Z.*: Vopr. onkol, Kharkoff. 2: 222, 1929. (4) *Liang, Zue*: Arch. f. Path. Anat. 259: 577, 1926. (5) *Orthmann*: Ztschr. f. Geburtsh. u. Gynäk. 15: 212, 1888. (6) *Sänger, M., und Barth, J.*: Die Neubildungen der Eileiter; Handbuch der Krankheiten der Weiblichen Adnexorgane, von A. Martin, p. 240-299, 1895. (7) *Watkins, R. E., and Wilson, W. M.*: Surg. Gynec. & Obst. 51: 125, 1930. (8) *Wechsler, H. F.*: Arch. Path. & Lab. Med. 2: 161, 1926. (9) *Wharton, L. R., and Krock, F. H.*: Arch. Surg. 19: 848, 1929.

1827 SPRUCE STREET.

A CERVICAL DILATOR

By L. H. McCalla, M.D., GREENVILLE, S. C.

THIS photograph shows a cervical and uterine dilator which I have found practical in my hands.

The instrument is made from a handle of a long curette. One end was threaded

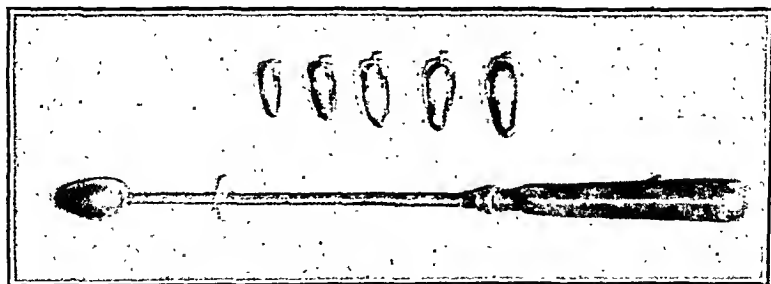


Fig. 1.

so as to fit different size olivary tips and the flange placed $2\frac{1}{2}$ inches from this end which is a protection from pushing the dilator too far into uterine canal. The total length of the instrument is $10\frac{1}{2}$ inches, it is light and easily handled and if two handles are available the nurse can change to the next size olivary tip while the smaller size tip is in use by the operator, thus avoiding any delay.

INIENCEPHALUS, WITH THE REPORT OF A CASE*

BY JOSEPH BEAR, M.D., RICHMOND, VA.

(Assistant Professor of Obstetrics, Medical College of Virginia)

FETAL monstrosities are always a source of scientific curiosity and in a certain percentage of cases may bring about varying degrees of dystocia and prolonged labor and are frequently associated with hydramnios. Iniiencephalus, or fetus retroflexus, is a very rare condition, being first described by Saint-Hilaire in 1836. Ballyntine had seen only 7 cases in 1904; he found they were usually born dead and

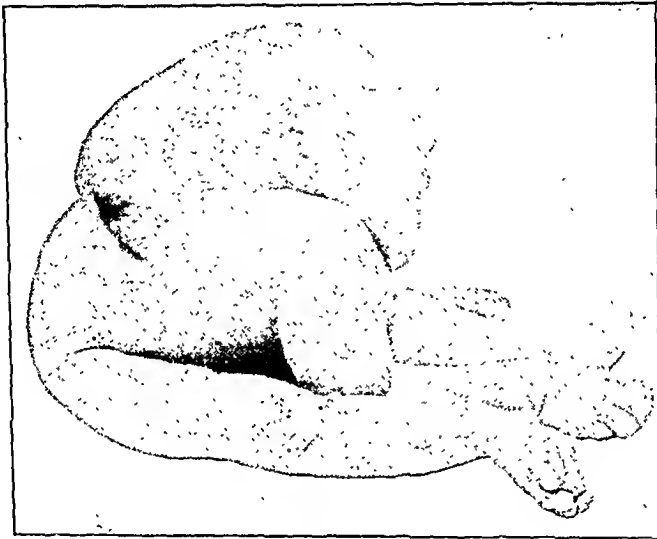


Fig. 1.—Lateral view.

premature; the majority were females. Dorland, of Chicago, in 1925 fully reviewed the literature and, with the report of an additional case of his own, gave a total of 38 cases. Since that time 2 other cases have been reported, one by Guess (1926) and the other by Welz and Lieberman (1927). My own case, together with two similar cases in this city reported by M. P. Rucker, increases the number to 43.

CASE REPORT

Mrs. J. W. A. was of medium size, well built, aged twenty, primipara. Her husband was in good health. Family history was negative. She had had the usual diseases of childhood. Her past weight was 99 pounds; at six months of pregnancy she weighed 120 pounds. Her chief complaint during pregnancy was shortness of breath, and palpitation of the heart. I saw the patient at the hospital in consultation with Dr. J. A. M., because she was in labor for about twelve hours.

*Read at the staff meeting of the Retreat Hospital, Richmond, Va., November 17, 1930.

No fetal movement had been felt for the past two days. Physical examination was essentially negative. The patient was found to be about seven months pregnant and in active labor. Height of fundus was 24 cm. Fetal heart tone could not be detected. Vaginal examination revealed the cervix completely dilated and the presence of the amniotic sac bulging tensely. The sac was artificially ruptured with a sudden gush of a large quantity of liquor amnii (hydramnios), followed in ten minutes by the expulsion of a 5¼ pounds stillborn fetus (L. M. A.). An immature placenta was expelled unaided fifteen minutes later (Duncan method). Duration of labor was fifteen hours twenty minutes.

Laboratory findings were negative. The first specimen of urine revealed a trace of albumin, positive sugar, and a few pus cells; one week later the urine was negative.



Fig. 2.—X-ray—dorsal view.

Description of Fetus.—Pathologic report by Dr. Chas. Philips. Fetal monster, white, female, 29 cm. long; extremities well formed and normal; arms well formed but unusually long and with large hands and fingers. The head, neck, shoulders and chest were deformed in that the head and neck were short and thick; there was a large cystic mass projecting backward from the brow and extending down to the level of the 12th rib over the spine at what ought to have been the level of the 2nd lumbar vertebra. There was the beginning of a bifid spine with apex of a wedge-shaped area below at this point which rapidly widened until at the junction of the deformed head with the

spine there was an opening of 2.5 cm. across the edges. This gap was covered with thin eroded skin and felt soft and cystic to touch. There was practically no brow because of the slope backward. From the opening of the posterior fontanelle backward to the divergent place of the bifid spine there was a soft cystic mass of an apparent encephalocele and spina bifida combined with apparent absence of the occipital bone. The shoulders were pushed forward by this mass and the lateral margins of it were the scapulae. The shoulders measured 8.5 cm. across and the head at the same level, 7 cm. The distance from the brow to the lower level of the cystic mass was 10 cm. and this gave a



Fig. 3.—X-ray—lateral view.

circumference of 28 cm., just 1 cm. below the total length of fetus. The occipitomenal diameter if there were an occiput would be 10 cm. At the level of the shoulders the circumference was 32 cm. while that under the arms was 28 cm. The legs measured 10.5 cm. from trochanter to heel, while the arms measured 16.5 cm. from acromion to the finger tips. Some material was aspirated by needle from the cystic head mass for microscopic examination.

The placenta of this fetus, which was elongated rather than round and measured 15 by 7 cm., was dark red and firm. The general development and structure were grossly normal except for the size. Weight was 200 gm.

Microscopic Description.—Aspirated material from the back of the cystic portion of the head mass showed brain tissue. The placenta showed immaturity of development and a marked active and passive hyperemia with blood stagnation; there were few areas of hyalinization and a little calcification.

X-ray Report.—The occipital region was rather distorted. There was a congenital malformation of the bodies of practically all of the upper and middorsal vertebrae and no spinous processes or laminae were detected in this region. The probabilities are that there was a large spina bifida in this region. Nothing of definite clinical significance was noted in the spine from the first lumbar downward. It is difficult, however, to give any definite opinion as at this age of fetal life, the vertebral epiphyses are all separated.

Postmortem examination revealed the following: Absence of occipital bone; posterior superior surfaces of parietal bones well marked. In place of occipital bone there was found a tough reflexion of dura. Frontal lobes cone-shaped running toward orbits; wide spina bifida; large diaphragmatic hernia (left); stomach and spleen in chest compressing lung inward. Right chest grossly normal. Uterus, tubes, and ovaries normal; kidneys present and normal. Intestinal tract and liver grossly normal.

Diagnosis.—Iniencephalus and spina bifida monster; immature placenta; hydramnios.

An early diagnosis is always essential to insure the proper management during labor. In addition to that of being in the class of pathologic freaks and curiosities, these fetal monstrosities frequently present problems of no little obstetric importance.

301 E. FRANKLIN STREET.

Malan, G. M., and Mackintosh, R. H.: Abscess in Abdominal Wall Simulating Ruptured Ectopic Gestation. *J. M. A. of So. Africa* 24: 628, 1930.

A case is reported of a young girl who had skipped a period and who following a fall developed a localized tender mass over the right lower quadrant of the abdomen suggesting a ruptured ectopic pregnancy. On incision this mass was found to be an extraperitoneal abscess. The author attributes its formation to rupture of the deep epigastric artery as the result of the fall with subsequent infection of the hematoma. After incision and drainage recovery was uneventful.

FRANK SPIELMAN.

MENINGO ENCEPHALOCELE WITH MICROCRANIA

By J. L. REYCRAFT, M.D., CLEVELAND, OHIO

(*Department of Obstetrics and Gynecology, Western Reserve University*)

THE case to be presented occurred in private practice, the patient being referred to us for maternity care by her family physician August 5, 1929.

Mrs. C., para i, aged forty-six, married eight years. An ectopic pregnancy of two months operated upon in 1923. Her appendix had been removed several years before this. She was a large woman, height five feet seven inches, normal weight about 160 pounds. The menstruations had always been regular until March 6, 1929, after which there had been none. Upon examination the uterus was found to be the size and consistency of four and one-half months' pregnancy.

The course of her pregnancy was marked by attacks of low bilateral abdominal pain, and at seven months she had a mild attack of pyelitis which responded quickly to rest in bed and the administration of diuretics. The abdominal wall was so firm and thick that palpation of the fetus was always difficult. This was made more so by the presence of bowel anterior to the uterus probably adherent to the old appendectomy scar. The fetus was active, but the heart sounds were always heard with difficulty.

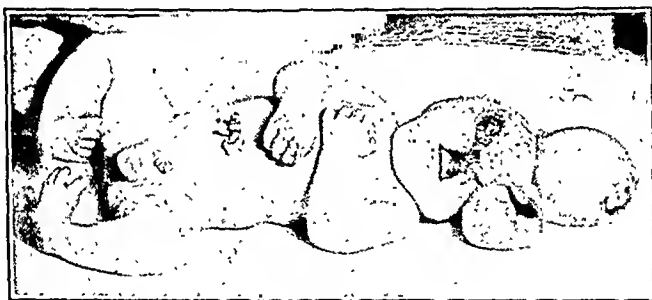


Fig. 1.

November 5, 1929, the uterus was no larger than a seven and one-half months' pregnancy. On November 27, the membranes ruptured spontaneously, and the following morning she was admitted to Maternity Hospital, having contractions every five minutes.

Rectal examinations at first showed no dilatation of the cervix and the presenting part seemed soft enough to suggest a breech, though no head was palpable in the fundus. Twelve hours after admission the contractions almost ceased and an internal examination was made under nitrous oxide anesthesia. We found the os dilated four cm. in diameter but very thin, and the fetus presenting by the face, right mentoposterior. An unusual sensation was experienced when the right eye of the fetus and the nose were felt, but the left eye was missing. Furthermore the mouth was not of normal contour, so the presence of a monster was suspected.

Delivery was effected with much difficulty, after dilating the cervix manually, when it was discovered that there was an internal contraction ring present just at the level of the baby's neck. Under deep ether anesthesia we were able to overcome this obstruction and deliver the baby by means of podalic version. It lived nine hours after birth. The mother made an uneventful recovery.

The fetus was photographed and x-rayed and then turned over to Doctor Zuck

of the Department of Anatomy for further examination. We are indebted to Doctor Zuck for the notes on this examination, which follow:

"Specimen is that of a full-term male fetus, white. The head has two periform protrusions arising from the left frontal and left parietal regions measuring $6 \times 8 \times 10$ cm. and $8 \times 10 \times 14$ cm. respectively. These are covered by skin, are freely mobile and fluctuant. There is dura matter beneath the skin with some hemorrhage subdurally, and both sacs nearly filled with brain substance not attached to dura. The brain was found to be continuous into the cranial cavity and the margins of the attachments of the sacs to the scalp and underlying tissues was found to be formed by a dense ring of connective tissue. Both eyes are present, the right quite superficial and completely formed; the left diminutive and buried laterally beneath the anterior encephalocele. The inferior orbital fissure on the right opens through to the cavity of the mouth, there being a complete cleft in the palate. There is a harelip on the left but no underlying deformity in this region. The premaxilla is tipped up somewhat, its right margin elevated due to the failure of fusion with the maxilla on the right.

"There is an associated clubbing of the second and third digits of the right hand with fusion in the region of their proximal phalanges. The second digit on the left has no nail.

"There is a bilateral talipes equinovarus."

This case was of unusual interest to us inasmuch as at first it appeared to be a type of cyclops but the anatomical study proved that the second eye was present although the left one was not developed. A similar case has been described by Dr. Ernest Sehwalbe in his *Die Morphologie der Missbildungen*, Jena, 1906, pp. 144, 196.

610 HANNA BUILDING.

PAROTID SWELLING ASSOCIATED WITH LACTATION, WITH THE REPORT OF A CASE

By LYLE G. PHILLIPS, M.D., HONOLULU, T. H.

ENLARGEMENT of the parotid glands occurring simultaneously with and definitely related to functional activity of the female breasts is a condition not included in the usual classifications of parotid swellings. Questions histologic, pathologic, and embryologic, which observance of such a phenomenon stimulates, prompt reporting the following case:

Mrs. W. G., aged twenty-four, Anglo-Saxon, came to me in July, 1927, for obstetric care. She was then in the eighth month of her first pregnancy. Her condition was normal with the exception of slight swelling of the left parotid gland. This swelling, she said, first appeared about the time of the establishment of the menstrual function. There was no associated discomfort, and palpation indicated a uniform enlargement of the entire gland. Mrs. G. was confined on July 15, and three days later the breasts became engorged. At the same time both parotids became acutely swollen, the patient presenting the classical picture of acute epidemic parotitis. Both glands were uniformly enlarged, the lobes of the ears protruded, the skin over the glands was stretched tight and shiny, and there was some discomfort associated with movement of the mandible. No rise in temperature occurred. Except for the disappearance of discomfort, this condition persisted, unchanged, during the eight months the patient nursed her baby. At the end of this

time she was advised to wean the child. Nursing was stopped, the breasts were bound for forty-eight hours, and lactation was terminated. Immediately, complete involution of the parotid swellings occurred, and both glands became normal in size.

In January, 1928, Mrs. G. again became pregnant, and during the last trimester of her pregnancy became conscious of renewed activity in the parotids. There was but slight swelling, however, until, on the third day following delivery, engorgement of the breasts and acute swelling of the parotid glands again occurred simultaneously. The swellings again persisted throughout the period of lactation, and disappeared promptly when lactation was terminated.

During neither of these experiences was the character of the salivary flow abnormal.



Fig. 1.—Showing parotid gland swollen after onset of lactation.

Why glands unrelated to the breasts both in embryologic development and in physiologic function should behave thus in connection with lactation is a difficult question to answer. Aberrant mammary tissue is frequently found elsewhere than in the breasts, but no reports are known to me of these being located anywhere except in the so-called crista lactea, running from the axillae diagonally onto the abdomen. Biopsy has not been done in this case.

SPONTANEOUS RUPTURE OF THE UTERUS FOLLOWING A WEDGE-SHAPED RESECTION OF THE FUNDAL PORTION

BY SAMUEL S. ROSENFELD, M.D., NEW YORK, N. Y.

SPONTANEOUS rupture of the uterus is an infrequent complication of pregnancy. In a series of 417 cases of uterine rupture, Stein considered it spontaneous in 67 cases.

One of the commonest causes of rupture of the uterus during pregnancy is a weak uterine scar following cesarean section. Rupture also occurs acutely, in which case it is usually due to falls or direct injury to the abdominal wall. Ruptured uteri, which were treated conservatively, have been known to rupture during subsequent pregnancies. Pelham, quoted by Munro Kerr, gives several instances of this accident. Any operation on the uterus that leaves a scar, or fixes the organ, renders it vulnerable to rupture should a pregnancy occur.

In spontaneous rupture, there is frequently no demonstrable uterine disease. The seat of the rupture is nearly always in the fundus. In women who have been subjected to cesarean section, rupture usually takes place in the scar. The incidence of rupture in placenta previa is somewhat higher than in cases where this abnormality is not present.

The case that I here report followed a wedge-shaped resection of the uterus.

Mrs. D. S., aged thirty-eight, was admitted to Lebanon Hospital on April 8, 1930, with the following history: She was perfectly well until a few hours before admission, when she experienced a sudden severe attack of pain, in the lower abdomen. The pain was not localized. She fainted several times. There was no vaginal bleeding. Her last menstrual period was in the latter part of January.

The patient was a para iv, gravida iii. Three children alive and well. Had one criminal abortion. Her menstrual periods commenced at the age of thirteen, were of the twenty-eight-day type and lasted seven days. She had always had dysmenorrhea. She was operated upon May 10, 1926, at which time a wedge-shaped piece of uterus, the size of an orange was removed from the fundal portion. The pathologist reported that the tissue removed was composed of uterine muscle with an increase of connective tissue in the musculature. At that time, the operator stated, he would have performed a hysterectomy, but for the fact that the intestines were firmly adherent to the left side of the uterus, both anteriorly and posteriorly. The patient made an uneventful recovery.

Operation, April 13, 1930. I made a median suprapubic incision and opened the peritoneal cavity. I found the cavity full of fresh and clotted blood. The fetus, in its sac, presented in the opening of the uterine fundus. The entire fundus was opened and the margins were very ragged. The uterus was entirely surrounded and buried by densely adherent intestines. The intestines that were adherent about the fundus were very thin and there was hemorrhage into the walls. I intended to perform a hysterectomy, but the patient was in such desperate condition, that

I did not think that she would be able to withstand a difficult hysterectomy with a possible bowel resection and anastomosis. The uterine fundus was sutured with interrupted chromic catgut. The sigmoid and omentum were fixed to the uterine wound. The right broad ligament and fallopian tube were also used to cover the uterine wound. A saline infusion was given while the operation was going on and a blood transfusion was given immediately following the operation. About 500 c.c. of saline was poured into the abdomen, before closing the peritoneal cavity. The abdomen was closed in layers.

For the first four days her condition was very satisfactory. She then began to vomit, and became distended. On the sixth postoperative day the distension was marked and the vomitus was coffee ground in character. She was deeply jaundiced and had marked dyspnea. The temperature was 101° F. She died on the eighth day following the operation.

Permission was granted for a partial autopsy and the following report is from the pathologist's protoeol: Well developed female, with marked pallor of the mucous membranes, an icteric tint to the skin, the abdomen was markedly distended and tympanitic. There was a clean operative wound in the mid-suprapubic region.

In the peritoneal cavity there was about 700 c.c. of dark brown blood fluid, and a few clots. All the intestines were markedly distended. In the lower abdomen all of the bowel was blood stained. In the upper abdomen some of the bowel was blood stained. The uterus was the size of a large orange. The superior surface was necrotic, greenish, and foul smelling. Adherent to this part of the uterus, there was the edge of the great omentum, and the right fallopian tube, both of which were necrotic. The ileum, about six inches from its junction, with the cecum was also adherent to this necrotic area. The adherent ileal wall was itself necrotic and when gently separated, this area was seen to be ragged and about the size of a half dollar, with the lumen of the ileum exposed. Just below and posterior to the necrotic surface of the uterus, the lower end of large bowel was adherent to the uterus by dense fibrous bands, causing a transposition of the rest of the colon to the right side of the pelvis, where the entire pelvic colon was situated. The stomach was normal in size and contained a dark brown liquid, which gives a strongly positive test for blood. There was no ulceration. The mucosa of the small bowel was smooth and not ulcerated. In a few areas, there was intense congestion. The terminal ileum, the cecum and ascending colon, contained a dark red, bloody liquid. When opened longitudinally, the uterine cavity was small; and posteriorly and on the left side, there was a projection upward of the cavity, resembling a horn, the top of which was necrotic, so that a probe could be passed directly through the necrotic area, to which the bowel and omentum had been adherent. This had been the point of perforation. The cavity itself was clean and only slightly hemorrhagic. The wall of the uterus, except at the point of perforation was thick and fibrotic. The left tube and ovary were normal. The right adnexa were extremely congested and the terminal portion of the tube was incorporated in a mass on the top of the uterus, together with the bowel and omentum. The urinary bladder was normal. The liver was normal in size and the surface smooth. The gall bladder was distended and contained dark green bile. There were no gallstones. The extrahepatic ducts were normal. The liver on section was pale, icteric and spotted with areas that appeared to be fatty. There were no abscesses or necrotic areas. The spleen was small and normal in appearance. Both kidneys were pale, icteric and normal in size. The capsules stripped easily, leaving a smooth surface. The markings were distinct and the cortex of normal thickness. The lungs were both free in the pleural cavity, and showed congestion of the bases. The heart was normal, except for slight sclerosis at the base of the aorta. The myocardium was pale, and the wall in the right ventricle rather thin. On microscopic examination, the spleen showed slight congestion. The kidney showed no

pathologic change. The liver showed cloudy swelling and beginning fatty degeneration. The lungs showed intact alveolar walls and the alveolar spaces were filled with many blood cells. The heart showed no pathologic change. The uterus showed a musculature that was diffusely infiltrated with many pus cells. There was a moderate degree of fibrosis.

Pathologic Diagnosis.—(1) Necrosis and degeneration of the uterus and ileum, (2) peritonitis, (3) congestion of the lungs and fatty infiltration of the liver with cloudy swelling.

REFERENCES

Goldstein, Leopold: M. J. & Rec. 120: 156, 1924. Goodman, Charles: J. A. M. A., Oct. 14, 1924. Markoc: Bull. Lying-In Hosp., April, 1916. Scott, William A.: Am. J. Obst. & Dis. Women 76: 1917. Waldo, Ralph: Am. J. Obst. & Dis. Women 62: 1910.

2021 GRAND CONCOURSE.

TRANSPLANTATION OF AN URETER INTO THE SIGMOID IN A PATIENT WHOSE OTHER KIDNEY WAS FUNCTION- LESS. PRIMARY RECOVERY*

BY JAMES M. PIERCE, M.D., ANN ARBOR, MICH.

(Associate Professor of Obstetrics and Gynecology, University of Michigan).

IN A PAPER, "Operations upon Solitary Kidneys and Ureters," Walters and Wright reported that Coffey had transplanted a solitary ureter in two cases and Hunt had transplanted another in one case. In these cases it was known that only one kidney was functioning. In the case reported here a single ureter was transplanted without knowing that the other kidney was not functioning. This was due to the fact that the patient withheld some valuable information and because the bladder was so badly torn that the ureteral orifices could not be located by the urologist.

Mrs. E. H., white, married, aged thirty-seven years, entered the clinic August 15, 1929, complaining of urinary incontinence.

During the patient's thirteenth delivery in February, 1925, the base of the bladder and urethra were torn away by forceps. An attempt was made to repair the bladder in July and October, 1925. Both attempts were unsuccessful. Since that time the perineum had become very tender, there had been some pain in the lower abdomen, and pain in the region of the left kidney. There had also been some blurring of vision accompanied by frontal and occipital headaches. During the past three months there had been some swelling of the ankles and dyspnea. The patient had lost about thirty pounds and believed she had become generally weaker.

Examination showed a well-developed, overnourished adult female who appeared at least ten years old than her stated age (thirty-seven years). She did not appear to be acutely ill and cooperated well throughout the examination. The general examination was entirely negative except for some left costovertebral tenderness. No edema of the ankles. Blood pressure 125/75 mm. Hg.

Pelvic examination showed a marked hypertrophy of the labia minora with reddening of the labia and skin of the thighs due to the irritation of the urine coming from the vagina. There was a relaxed perineum with rectocele. The urethra was absent and the vaginal surface of the bladder absent. There was much scar tissue about the fistula which extended up to the cervix. The cervix had a

*From the Department of Obstetrics and Gynecology of the University of Michigan.

deep bilateral laceration with eversion, erosion, and chronic endocervicitis. The fundus uteri was forward, normal in size and freely movable. The appendages were not palpated.

A diagnosis of vesicovaginal fistula was made and bilateral ureteral transplantation was advised.

The patient was then referred to the Department of Genito-Urinary Surgery for examination of the ureters and kidneys. They stated that the ureteral orifices could not be found and that the condition of the ureters and kidneys could not be determined by their methods of examination.

August 24, 1929, the right ureter was transplanted into the sigmoid by the retroperitoneal method. The operation was made somewhat difficult by the thick panniculus. When the patient was returned to bed her temperature was 98°, pulse 92, and respirations 24.

Convalescence was rapid, highest temperature was 99.6°. There was good drainage from the rectal tube and the only complaint was abdominal distress due to gas pains. When the rectal tube was removed at the end of a week there was no discharge of urine from the vagina. There was considerable drainage from the abdominal wound. Ten c.c. of indigo earmine injected intramuscularly did not appear in either the vagina or abdominal wound, and the patient could control her urine.

The patient was then told that she must have had only one kidney or else the left kidney had ceased to function. She then informed us that she had been told that her left kidney had been destroyed "by stones or abscesses." When asked why she had withheld this information before her operation, she stated that she had also been told that if she gave this information we would not operate upon her.

The abdominal incision drained for several weeks and then closed completely. The patient had control of her urine but also had headaches and some blurring of vision.

The patient was not seen again until Dec. 31, 1930, when she was visited in her home. She still had headaches, blurring of vision and dryness of the mouth. She stated, however, that she did not feel any worse than before her operation. She is able to care for her family of six children and aged father and mother. She does not have to empty the rectum during the night and only at two- to three-hour intervals during the day. Blood pressure 190/96. A specimen of blood was obtained, nonprotein nitrogen, 51.4.

The internists do not believe that a blood nonprotein nitrogen of 51.4 means very much in these cases, because one cannot determine how much nitrogen is absorbed from the urine in the bowel. However, the high blood pressure would indicate a nephritis, which probably was present before the ureteral transplantation, and was aggravated by the operation.

Comment: This case demonstrates first that an ureteral transplantation can be performed successfully when there is only one kidney and secondly that our present methods of determining the amount of kidney function are very inefficient.

REFERENCE

- (1) *Walters, Waltman, and Wright, William*: Surg. Gynec. Obst. 51: 836, 1930.

TWO ADDITIONAL CASES OF ACUTE PUERPERAL INVERSION OF THE UTERUS TREATED BY ABDOMINAL REPLACEMENT

BY FREDERICK C. IRVING, M.D., AND FOSTER S. KELLOGG, M.D.,
BOSTON, MASS

HITHERTO we have traced the origin of abdominal reposition in acute inversion of the puerperal uterus,¹ described the technic and reported five cases so treated without mortality,² and classified the condition for treatment.³

We do not feel that a further article is warranted at this time. However in view of the rarity of the condition, the high mortality by other methods, the interest in it as shown by Findlay's recent paper and because one death was reported in 1929 in Massachusetts from this cause, we feel justified in reporting two additional cases in our series.

One of us (Kellogg) has somewhat modified the technic previously described. The inverted uterus is grasped at one cornu in the region of the ovary and tube and this portion of the uterus replaced with Allis forceps as in the original procedure. It was found accidentally that either with or just following the reposition of this portion of the uterus the other horn flops up itself. The advantage is fewer bites in the peritoneum and on the whole less traction force is necessary.

The following cases are reported unedited from the records of the Boston Lying-In Hospital.

CASE 1 (Six in our series) (Irving).—Primipara entered hospital 7:20 P.M., April 14, 1928, in active labor with steady regular pains. She was given morphine and scopolamine. Head on perineum with fully dilated cervix at 2:20 A.M. Under gas-oxygen ether anesthesia, low forceps done after median episiotomy. Meconium stained amniotic fluid. Episiotomy wound repaired.

Placenta and membranes delivered intact twenty-two minutes later following moderate Credé. No more pressure was used than with other patients.

Following delivery a steady trickle of blood came from the vagina. Blood was clotted and did not appear fresh as from cervix, 1000 c.c. rectal saline. Blood pressure falling rapidly and pulse rising as fast.

A suggestion of a square topped uterus low down with a crater in middle suggested inversion.

Vaginal examination showed complete inversion with the rough interior of the uterus as big as an orange in the vagina. Hemorrhage continued during examination, patient rapidly grew worse.

Eight hundred c.c. intravenous saline was given following which blood pressure became perceptible and pulse a little stronger.

Vagina after examination was washed out with 3000 c.c. saline and 100 c.c. 70 per cent alcohol. Immediate laparotomy and transfusion started. Under gas-oxygen anesthesia, abdomen was opened, uterus found inverted, replaced by the usual technic, abdomen closed in layers without drainage.

Patient transfused again, 500 c.c. citrated blood. At end of hour blood pressure 100, pulse 124.

Convalescence nonfebrile, except slight temperature rise first two days, pulse never over 100.

Ready for discharge on fourteenth day. Kept on account of cardiac disease. Nursed the baby who gained.

CASE 2 (Seven in our series) (Kellogg).—Primipara normal in every respect, in labor nine hours. Head on perineum and starting to crown. Gas-oxygen and ether given. Head delivered with pressure on fundus. Cord around baby's neck, clamped and cut. Seen to be very short. Baby breathed immediately.

Placenta expressed following separation nine minutes after delivery of infant. On removal of placenta, uterus seen to be projecting through vagina, relaxed and inverted completely. Moderate bleeding. Attempt was made to reduce inversion by gentle pressure on the inverted fundus. Cervix contracted and prevented reduction. Bleeding was moderate. Vagina was packed with two three-yard strips. Patient in moderate shock with continued hemorrhage. Prepared for immediate operation.

Within one hour of the inversion gas-oxygen and ether, 5 inch median low incision. Uterus found partially inverted with tubes and ovaries drawn into the inversion, ovaries being at edge. Inversion readily replaced with Allis forceps in the usual manner. Uterus which was blanched at the beginning of the operation had its normal color immediately following replacement. Abdomen closed in layers without drainage.

During the hour between inversion and operation patient was in a fair amount of shock with a rapid fairly thready pulse, around 130 and slight bleeding. (The anesthesia chart, however, shows that the anesthetist could not count pulse, though it was perceptible and that the blood pressure ranged from 72 over 50 to 52 over 40.) At end of operation the patient's pulse was better and her facies looked much better. However, she was given one 500 c.c. citrate transfusion.

Operation begun at 7:14 was finished at 7:37. Convalescence normal except for two-day temperature rise. Mother and baby discharged well.

We have now seven consecutive cases of acute inversion of the puerperal uterus treated by abdominal reposition without mortality.

It may be of interest to note that five of the seven patients were primipara.

We have nothing to add to our previously published comments except that with each experience we are more impressed with the simplicity and efficacy of this procedure.

REFERENCES

- (1) *Huntington, J. L.*: Boston M. & S. J. 184: 376, 1921. (2) *Huntington, Irving, and Kellogg*: AM. J. OBST. & GYNEC. 15: 34, 1928. (3) *Kellogg, F. S.*: AM. J. OBST. & GYNEC. 18: 815, 1929.

475 COMMONWEALTH AVENUE.
19 BAY STATE ROAD.

CONGENITAL HERNIA OF UMBILICAL CORD WITH EVENTRATION AND ABSENCE OF A SAC

BY JOHN F. KRUMM, M.D., CHICAGO, ILL.

(Department of Gynecology and Obstetrics, Northwestern University Medical School)

THE case I am about to report is one of complete eventration, with a small abdominal opening and with no evidence of any form of a sac; the bowels undoubtedly had been floating in the free amniotic fluid during intrauterine life. As occurs in many of these cases, there were other associated embryonal defects and some of these probably explain the occurrence of the exaggerated conditions in this patient.

The patient was a primipara, aged twenty-six years. Family history was negative except that grandmother of child on paternal side had a slight shortening of one upper extremity. The Wassermann test was negative. She had a spontaneous miscarriage of eight weeks' duration in February, 1927.

Last menses occurred on July 4, 1927, calculated date of confinement April 11, 1928. Nausea and vomiting persisted until the end of the third month. Otherwise entire prenatal period was uneventful until onset of labor. Fetal heart tones were 144 at each visit, once every two weeks. Last visit was April 5, 1928, three days prior to onset of labor.

On Sunday, April 8, patient was taken automobile riding over rough streets with the idea of precipitating labor. Labor pains were first noted at 11 P.M. that same night, but they were so weak and irregular that she did not call the doctor until 8 A.M. the following morning, April 9. She was seen at 9 A.M. in the hospital and on examination the cervix was found to be dilated about one and one-half fingers and with very little effacement. Blood pressure was as usual, 110/72. The urine was negative. Pains were recurring every twenty-five to thirty minutes and of short duration. Fetal head was entered in pelvic inlet and position was left occipito-anterior. Fetal heart rate was 180 as compared to the former constant rate of 144. There was no vaginal show or other bleeding.

Everything appeared normal except the fetal heart rate and in view of the foregoing history the possibility of a partial abruptio placenta with occult bleeding was considered. There were, however, no other confirmatory signs.

The fetus without a doubt was in distress, but a rapid delivery could only be done by cesarean section. This was postponed and the fetal heart rate was taken every fifteen minutes without any change until complete dilatation occurred, and membranes were ruptured at about 5:30 P.M. Immediately following this procedure the fetal heart rate rose to 195+ as nearly as could be counted. Meconium now appeared at the vulva. An episiotomy and an immediate midforceps delivery were done, with a viable child born at 6 P.M.

Examination of the child revealed the stomach and coils of small intestines and cecum, greatly distended, and these as well as the liver and omentum, protruded from an umbilical opening the size of a silver dollar and passed alongside the umbilical cord. The cord divided just before entering the abdominal cavity. There were no evidences of a covering for the viscera; the peritoneum ended at the umbilical opening, and only the cord itself was covered with a membrane. The stomach and coils of intestine were matted together in places and when separated a fibrinous material was seen. The viscera were not hyperemic but simulated ordinary bowel serosa.

On inserting a finger through the umbilical opening only a very small shallow cavity was found, hardly large enough to admit even one-half of the distended stomach. Any attempt to replace the viscera under these conditions naturally was futile and so these were merely covered with moist warm gauze and the baby was placed in an incubator where it remained alive for eighteen hours.

Later examination revealed that there were five diverticulae the size of an average adult appendix, one on the posterior wall of the stomach and the rest along the intestinal tract. The transverse colon was severed in its midpoint by the mesentery and both ends were closed off blindly. The rectum was found to be a solid cord, the bowel above being normal but distended, and the anal canal below also appeared normal. Two toes of the right foot were webbed, and the left foot was almost amputated at the ankle as a result of the cord winding about at that point.

Probably the embryologic arrest of the rectum and the blind endings of the transverse colon accounted for the distention of the bowels. Even though the two edges of the abdominal wall came well together except at the umbilical opening, the bowels were too greatly distended to permit of their being drawn into the abdominal cavity, as in the normal case. Also this made it unnecessary for the abdominal cavity to develop at the same pace and to the same extent as the growth of the eventrated viscera and thus an artificial reduction of the hernia was made impossible.

It is also conceivable that the original sac which was undoubtedly present in early fetal life, ruptured, possibly under tension of the distended bowels, and subsequently its edges retracted and atrophied.

The etiology of the severed transverse colon and of the diverticulae is not as easily explained.

Fortunately in this case conservative obstetrics was resorted to, thus sparing the mother the added risk of a cesarean section.

From an embryologic standpoint this rare anomaly is especially of interest on account of the small abdominal opening associated with so marked an eventration. Also because of the contrast of the shallow abdominal cavity in comparison to the large viscera; and because of the absence of a hernial sac.

Clinically the case is interesting because of the absence of abnormal symptoms or signs until the onset of labor; and because of the difficulties presented in determining a suitable means of terminating labor.

This patient gave birth to a normal child in January, 1930.

4753 BROADWAY.

Davanzo: The Resistance of the Hemoglobin in the Gynecological Field. *Ann. Obstet. e Ginec.* 52: 133, 1930.

The author, employing the Kruger method, affirms that the posthemorrhagic increase of hemoglobin resistance observed in animals is not a constant finding in man.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

A VAGINAL SPECULUM FOR CAUTERIZATION OF THE CERVIX

BY RICHARD LIFVENDAHL, M.D., CHICAGO, ILL.

(From the Department of Gynecology of the Post Graduate Hospital and Medical School)

CAUTERIZATION of the cervix uteri for endocervicitis, eversion, and inflammatory changes of the everted mucosa, polypi, and cystic degeneration, if not too extensive, can be done without any form of anesthesia and is now regarded as an office procedure. Ordinarily the metal bivalve speculum, widely opened, affords sufficient exposure of the cervix and retraction of the anterior and posterior vaginal walls to permit adequate treatment of the pathologic area. However, many patients complain of considerable local heat in the vagina, particularly if the Post cautery is used. In several instances this sensation has led the woman to believe that she

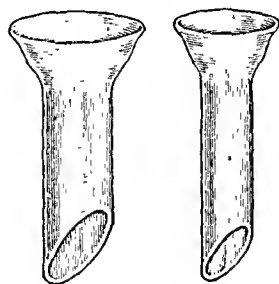


Fig. 1.

is about to be burned and has therefore attempted to "pull away," resulting in the cautery point touching the unprotected lateral vaginal walls, causing a painful thermal ulcer of three to six days' duration, at the same time leading the patient to discontinue further treatment.

A plain or "milk glass" Ferguson speculum would assure more comfortable treatment and prevent this accident from occurring; however, the possibility of the glass being "cracked" by the heat and leaving small fragments of glass in the vagina prohibit the use of this type of instrument.

The specula just referred to have the general outline of the older milk glass speculum but are constructed of very heavy Pyrex glass which serves as a protector of the entire circumference of the vaginal wall, exposing only the part to be treated, thus affording better opportunity for more complete treatment and preventing accidents.

Society Transactions

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, NOVEMBER 21, 1930

DR. J. P. GREENHILL demonstrated a specimen of **Krukenberg Tumor**.

A woman, 35 years of age, entered the hospital with a history of epigastric pain and belching for twelve years. Menstrual history was entirely negative. She had had two children. Physical examination revealed a small adenoma of the thyroid, a small mass under the skin of the chest just above the left clavicle, and two fairly good sized masses in the abdomen, one in each quadrant. On bimanual examination the cervix and uterus were both normal, but the two large masses were easily felt. In addition, in the posterior culdesac there was a small irregular mass, 2 cm. in diameter. The diagnosis before operation was malignancy of the ovary, most likely a sarcoma. At operation she had two smooth, hard masses in the ovaries. Both ovaries and uterus were removed. The small mass found on bimanual examination was adherent to the sigmoid and was difficult to remove. After operation examination of the tumors revealed them to be Krukenberg tumors. X-rays of the gastrointestinal tract taken after operation were entirely negative. The tumor mass above the clavicle will be removed later. She has had deep x-ray therapy over the mass adherent to the sigmoid, and it is difficult to feel it now. In spite of that, a proctoscopic examination will be made to discover, if possible, the source of this tumor. The chest and breasts are negative.

DR. IRVING F. STEIN AND ELIZABETH J. COPE (by invitation) presented a paper entitled **Trichomonas Vaginalis: A Preliminary Study**. (For original article see page 368.)

DR. EDWARD L. CORNELL, DR. L. J. GOODMAN AND DR. MABEL M. MATTHIES (by invitation) presented a paper entitled **The Culture, Incidence and Treatment of Trichomonas Vaginalis**. (See page 360 for original article.)

DISCUSSION

DR. WILLIAM H. TALIAFERRO.—To a protozoologist these two papers on *Trichomonas vaginalis* have touched on some extremely interesting points. In particular I refer to the questions of incidence, pathogenicity, treatment and specific differences of it and other human species. In discussing these questions, particularly that of pathogenicity, I wish to emphasize emphatically that you with your clinical contacts are the final arbiters, that protozoologists with their reliance on laboratory material and animal experiments can only make suggestive findings and wait for the final answer from you.

The question of the pathogenicity of all of the human trichomonads is a much debated question. *Trichomonas hominis* of the intestine on which most work has been done certainly occurs more frequently in persons with diarrhea than normal persons. A large number of protozoologists feel, however, that this is due to the fact that in disease there are more favorable living conditions for the flagellates and that they are easier to find in loose than in normal stools. In spite of much

work there are very few clear-cut cases pointing to pathogenic action of the flagellates. There are such cases as: Wenyon (1920) who found an invasion of the glands of the intestine, but this may have been a postmortem invasion; Kessel (1925) who reported *Trichomonas* in pus from a liver abscess, but here amoebae were the primary invaders; Wenyon (1926) who stated that in guinea pigs the *Trichomonas* often invaded the intestinal wall, but here we are not certain that it is the primary invader; and Kessel (1928) who found an actual colitis in kittens after infection with forms from man.

It seems to me that there are still some difficulties in accepting the pathogenicity of *Trichomonas vaginalis*. It is an exceedingly common parasite of women (incidence ranges in different studies from 10 to 60 per cent examined) and at times it is very difficult to find. In the diseased conditions described, may it not be a secondary invader, the diseased condition supplying a favorable environment and causing a light infection of the flagellate to flare up?

Treatment bears indirectly on the question of pathogenicity. In the intestinal form Hegner has shown that a high protein diet greatly reduces the infection. Here, apparently, the treatment changes the bacterial flora and indirectly affects the parasite. Similarly, Ratcliffe has found that certain of the resorcinol derivations are effective against the trichomonads of rats, but here again the effect is indirect through the action on the intestinal bacteria. In regard to the treatment described, is there a possibility that it is not affecting the *Trichomonas* directly but clearing up some other condition favorable for the flagellates?

The question of specific differences between the trichomonads from the intestine, mouth, and vagina is again a much debated question. Many protozoologists feel that the obvious differences found are due to differences in the food, etc., of the different sites. In this connection it is interesting that Hegner has been able to grow the intestinal and vaginal trichomonads of the monkey in cultures and to transfer the intestinal forms to the vagina in two of six cases.

Most recent workers have used Tanabe's (1929) serum-saline-citrate medium for cultivating both the intestinal and vaginal *Trichomonas* rather than the media stressed by the speakers this evening. In regard to solid media it is interesting to note that Miss Andrews (1929) developed two types for *Trichomonas vaginalis*. The first was an agar slope to which was added serum-saline-citrate solution and the second was an asparagin-agar slope to which was added rabbit's serum diluted with Ringer's solution and a few grains of rice starch. She also found that a P_H of 7.6 was the most suitable for growth.

DR. CAREY CULBERTSON.—I have said on previous occasions when I have discussed the subject that in my experience I have not found *Trichomonas vaginalis* to be a common thing. I have found these infestations uncommon but in view of the many reports that come from clinicians from all parts of the country whose interest, accuracy and enthusiasm cannot be questioned, it is very difficult indeed to deny the possibility of a specific entity either from the clinical or laboratory point of view.

I have the impression acquired from writers reporting these cases in South America that intestinal infestation is extremely common. One writer in the Argentine seems to take it for granted that the vaginal infection is a direct contamination from the intestinal tract. These writers do not seem to bring up the question of difference in the type of organism. There are some things in the pathogenesis that are worthy of note and that have not been mentioned. Most of the writers who describe this type of vaginitis state that the cervix is not involved. That is more important in the pathogenesis than we ordinarily think. It does not mean that a patient with a preexisting cervicitis may not acquire a trichomonad infection, but it means that in the absence of a preexisting cervicitis due to gonorrhea or some other type of infection, cervicitis is not acquired from

this type of vaginitis. In a recent paper Dr. Kleegman described what she calls erosions associated with trichomonads, but she does not say that she examined these areas histologically to be sure that they were what we ordinarily call erosions. Until we have a histologic study of these areas on the vaginal portion of the cervix in trichomonad infections we cannot say these are erosions. I would be much more apt to believe that they are localized inflammatory areas.

As regards treatment, practically every clinician has his own favorite method. Holden uses methylene blue and Lassar's paste. Dr. Cornell says he uses Lassar's paste in association with mercurochrome.

I cannot see any reason why the frequency of recurrence may not mean re-infection, provided we can see no difference between the intestinal type of the organism and that recovered from the vagina. This idea is emphasized by Faulkner. He advocates greater care in cleansing the perineal region after bowel movement.

DR. CARL H. DAVIS.—We found that if dextrose broth were used as a culture media that one must constantly check it to be sure that the P_{H} remains practically the same as for human blood. As we checked it in our laboratory, as it is ordinarily made up there is too much difference in the P_{H} to use dextrose broths in culturing the organisms. So during the past year we have gone back to the use of Loeke's solution to which we add 5 per cent of human blood serum and a moderate number of red blood cells. We have cultures from four separate patients who have been kept alive for four months.

Regarding the small areas that Dr. Culbertson mentioned, it is my opinion that they are areas of ulceration similar to those we see on the vaginal mucosa. I do not consider that they are in any sense comparable with the erosions in the cervical canal.

As far as treatment is concerned, I am not convinced that we have any treatment that is satisfactory for *Trichomonas* excepting so far as to avoid the use of irritating materials and keeping up the treatment over long periods of time, especially during the menstrual periods to avoid exacerbations which occur at that time. I do believe that a great advantage comes from the use of lactic acid just as soon as the acute symptoms have disappeared. There is a great difference of opinion as to whether the lactic acid helps restore the normal vaginal flora or whether it may have other effects. We know, in the first place, that lactic acid will not interfere with the normal vaginal flora. Most other materials used in the douche may interfere. In the second place, those of us who have used it know that when lactic acid is used as douche material we get a more extensive desquamation and it seems that this may be essential in producing a cure.

DR. J. P. GREENHILL.—The more I see of these cases the more I believe that the *Trichomonas* is a pathogenic organism, but whether it is the cause of the patient's disturbance it is hard to say. We know that if we treat the patients and get rid of the *Trichomonas* and with it the associated organisms, that the patients are cured or at least temporarily relieved. In that connection I would like to mention one case. This patient was under the care of Dr. Philip Lewin at St. Luke's Hospital for an arthritis of the right hip. I was asked to see her because of a vaginal discharge. I found *Trichomonas* and cured the condition after treatment. Strange to say, the arthritic condition improved so that she is now practically cured.

The source of infection or reinfection is very interesting. Dr. Cornell mentioned that in two patients sleeping in a bed that had been occupied by a patient with a vaginal discharge had produced the condition. Personally, I do not think that is true, because some men have been bold enough to take the discharge from one patient and transfer it into another patient, but have not produced a discharge.

I thought the areas of erosions referred to by Dr. Culbertson and Dr. Davis were hyperemic.

DR. CHARLES S. BACON.—In regard to pathogenicity, I would like to ask whether it has been shown whether the larger specimens of the *Trichomonas vaginalis* would change into the smaller ones of the intestine. Another thing, no attention has been called to the *Trichomonas* found in the oral cavity. I believe that it is rather frequently found, especially in patients with pyorrhea and gingivitis. It is a question whether that might not be the original source of the intestinal infestation as well as for the vagina.

DR. E. D. PLASS.—There are one or two things which have come out in our study of this infection which may be of interest with regard to the pathogenicity of the organism. The first is, that at the beginning of a profuse white leucorrhea one is very apt to have a high incidence of *Trichomonas* infection, the incidence disappearing as the discharge clears up. That is evidence, if it is evidence at all, in favor of the *Trichomonas* being a secondary invader as has already been suggested. It is essential to get the *Trichomonas* in pure culture. All the cultures which have been obtained so far I believe are mixed. The evidence obtained from inoculation is none too clear. If, however, we can succeed in getting the organism in pure culture and then perform a reasonable series of inoculations under known conditions of P_H and under known conditions of discharge, we should be able to show whether the organism is pathogenic or not.

The second observation is regarding treatment. I would like to add one factor to the long list Dr. Cornell has already used. It is arsenic in the form of one-half to two per cent solution of neoarsphenamine. I have tried it in one or two patients, and it seemed to be more effective than anything else. It is introduced on a tampon and can be left in for a considerable period without producing any irritation.

DR. DAVID A. HORNER.—I am interested in the use of ordinary water in the treatment of *Trichomonas vaginalis*. The vagina is thoroughly scrubbed out. All the folds of the vagina are distended so that there are no crypts for the organisms to hide in. Sterile water or plain ordinary tap water in large quantities should be able to kill the *Trichomonas*. The ordinary douche in the treatment does not seem to be sufficient, but if a long-continued douche, of five, ten, or twenty minutes, is carried on once or twice a day, the organisms will not be found when the patient returns for subsequent examination.

DR. STEIN (closing).—I would like to touch on one or two points, one made by Dr. Taliaferro that very likely the alteration of the condition of the vagina renders a favorable medium for the development of the large numbers of *Trichomonas vaginalis*. We have detailed the work of Dr. Andrews in our manuscript. We found that her method was fairly satisfactory. However, we feel that the medium we described was most satisfactory for the cultivation of the vaginal organism.

The reason for using a solid medium with liquid added to it, was that we found a great quantity of growth appearing in the solid medium under culture.

I agree with the question Dr. Culbertson brought up about erosions. I never looked upon them as true erosions.

We have found that the very stubborn cases that do not respond to ordinary office treatment, will sometimes respond to very vigorous treatment under gas anesthesia.

Dr. Plass's observations are most interesting. I have had no experience with Dr. Horner's method of treatment.

DR. CORNELL (closing).—In two cases I found plastic adhesions between the vaginal wall and the cervix following the brisk treatment of washing out the vagina. I agree with Dr. Horner that plain water will clear up the secretion for

a period of time, but I have not been able to cure a patient with plain water or any other method of treatment unless it has been carried out over a long period of time, that is at least six months.

DR. DAVID S. HILLIS presented a paper entitled, **The Diagnosis of Contracted Pelvis by the Impression Method.**

ABSTRACT

Though much attention has been given to the study of the various types and sizes of contracted pelves, we are still without a thoroughly satisfactory method for accurately determining the size of the head. A successful method to determine this relationship must include a consideration of the size of the head as well as the capacity of the pelvis.

Perhaps the most rational method of making this measurement has been suggested by P. Mueller and modified by Monroe Kerr.

A modification of the Mueller maneuver is here proposed. It is practically painless and requires no skill beyond that which may be acquired by the doctor in general practice. It is a diagnostic procedure which makes it possible at or before labor to separate all cases into classes: those in which it is known that the head will pass the inlet and those in which the mechanism is doubtful or impossible. It is not recommended as a substitute for the usual diagnostic methods but should be used in addition to them.

The application of this method presupposes a knowledge and use of the following facts: The important diameters of the head and the pelvis are the biparietal diameter and the true conjugate respectively. The successful passage of the head through the inlet depends upon the relative sizes of these two diameters. When the biparietal diameter has passed the true conjugate, bony resistance at the inlet has been overcome. When the lowest bony part of a moderately molded or unmolded head has reached a line drawn between the tips of the spines of the ischium, the biparietal diameter is passing the true conjugate. Allowance must be made for the caput succedaneum and thickness of cervix or lower uterine segment in front of the head. If a head lies lower than this level or can be impressed below this point, it is positive evidence that no bony disproportion at the inlet exists.

With the use of this method it has been shown that the widely prevalent idea that the head at term cannot be pushed downward any appreciable degree with the cervix undilated and the bag of waters unruptured is untrue. In approximately 90 to 96 per cent of all cephalic presentations at term, the lowest part of the head can be impressed to or below a line drawn between the tips of the spines of the ischium. This number, of course, includes those cases in which the head already lies at such a level.

With the patient in the lithotomy position on a table, not too high, the examining finger in the rectum locates the tips of the ischial spines and notes the relation of the lowest part of the baby's skull to a line drawn between them. The hand on the outside is placed above the breech of the baby and is sunk as deeply as possible toward the mother's spine, *the forearm parallel to the long axis of the mother*. Pressure is then made on the breech toward the inlet and the descent of the head noted with reference to the interspinous line, allowance being made for the thickness of the lower uterine segment, the cervix or caput succedaneum if present. To avoid traumatism and pain the pressure is begun gradually and after the maximum is reached is slowly released.

If the head cannot be impressed to the spines, an assistant places the palm of one hand flatly over the middle of the baby's back to prevent flexion and the fingers of the other hand placed palmar surface downward above the head over

the symphysis presses the head downward and backward in the axis of the inlet while the examiner makes pressure on the breech and notes descent with the internal finger. If the impression fails with the aid of an assistant a trial is made under a short surgical degree of anesthesia.

With the use of the method in several thousand cases by interns in the prenatal clinic and in the wards at Cook County Hospital, there has never been observed bad effects of any kind whatsoever to mother or babe.

If, after a fairly early rupture of the bag of waters in labor, the head cannot be impressed to or below the spines a cesarean section may be done at once and in our opinion with proper facilities at hand is justified.

DISCUSSION

DR. CHARLES B. REED.—For many years obstetricians of great repute and great talent have devised means for estimating the relationship of the head to the pelvis. It is surprising to me that none of them have happened upon or thought of this extremely simple maneuver which Dr. Hillis has shown us. Everyone who is interested in obstetrics will be able to use this method which requires no instrumentation assistance, with the greatest degree of certainty as to the results.

DR. A. F. LASH.—I have used this method for five years in private practice and at the Cook County Hospital.

DR. JOSEPH BAER.—I would like to ask Dr. Hillis to discuss for a moment the value of the impression method in connection with the flat type of pelvis and whether he believes that before labor it is possible to make sufficient pressure on the ovoid to throw the head into deflexion so as to get the head to sink into the enlargement left in the bitemporal relationship. My own practice has been the use of the Müller maneuver, which for many years I have used routinely in primiparas shortly before the calculated date of the onset of labor and I hardly ever find it necessary to use an anesthesia. Then having found the lateral disproportion, I have allowed the patient to go into labor and to await the test of labor. In other words, I have pretty nearly eliminated for myself the use of the Müller method or any other pelvic measurement method, relying on the onset of labor and the early hours of labor to tell me whether or not there is going to be a disproportion.

DR. W. C. DANFORTH.—I have not had great experience with the method in women not in labor. I have used it in women in whom dilatation was almost complete and found it a very valuable maneuver. I hardly think the 5 per cent in which he states the head cannot be impressed should be considered immediately as candidates for cesarean section, and I do not think Dr. Hillis wished to give us that impression, because we have all seen cases in which the head does not enter the pelvis until late, and we all wait for molding to occur in cases of relative disproportion. In cases where we do not get the head I would still be inclined to wait for the test of labor. I think Dr. Hillis has been rather conservative in the test of labor, because we have had no difficulty in using a rather complete test of labor in conjunction with low cervical section.

DR. HILLIS (closing).—Dr. Baer referred to caput succedaneum. I also know there is no caput succedaneum when the patient is not in labor, but evidently Dr. Baer did not understand that this method was expected to be used after the patient had entered labor, in which case there might be a very considerable caput. With a reasonable type of flat pelvis, the maneuver has been used only as a diagnostic procedure. It is my personal belief that if we restrict our cesarean sections to disproportion cases, where we cannot press the head to the spine after labor has started, we would see very much fewer unjustified cesarean sections than we do today. We know that when the head has to be molded a great deal in order

to get it through the pelvis, the danger of cerebral hemorrhage is great, as is the danger of vesicovaginal fistula, which happened in one of the cases I mentioned.

Dr. Danforth's experience with the almost complete test of labor, as he reported some months ago before this Society, is most excellent, but such a series of results would not be possible in less expert hands.

THE OBSTETRICAL SOCIETY OF BOSTON

STATED MEETING, NOVEMBER 18, 1930

DR. R. S. TITUS read a paper entitled **The Detection of Impending Intrauterine Death.** (For original article see page 382.)

DISCUSSION

DR. LOUIS E. PHANEUF.—Dr. Titus has emphasized intensive, intelligent prenatal care, which means more than routine examinations during pregnancy. Obviously it is always a sad thing if a woman loses her unborn child, but how much sadder it is for a woman who falls in the group of the diabetic, toxemic, nephritic, or habitual miscarrier, one who carries a pregnancy with some danger to herself, and loses her baby before it is born, when it might have been saved by prenatal care.

At the Prenatal Clinic of the Carney Hospital, which has existed for twelve years, we have insisted on seeing these patients every two weeks. I discovered that one month was too long, that toxemia might develop unnoticed, and in the last five or six years I have insisted on seeing patients every two weeks.

Dr. Titus had emphasized the absence of growth or retrogression, the absence of increase in weight or the loss of weight of the patient under observation. It is true again that we weigh patients routinely during prenatal care but most of us who are doing it are not doing it with the point of view of preventing intrauterine death but merely to prevent the patients by diet, etc., from having over-large babies and complicated labors, so while we are taking the weights for these cases, it will be well to bear in mind the three points mentioned.

DR. D. L. JACKSON.—From my personal observation, I believe that shrinkage in the size of a baby is observed not only in cases showing toxemia before they are due but it is also seen in cases which may be or are thought to be overdue. We see not infrequently in cases which are overdue, shrinkage of the uterus, and at delivery get a baby which has quite evidently lost weight. On delivery of the placenta we find an afterbirth showing marked calcareous deposits which has commonly been termed a ripe or over-ripe placenta, and which has degenerated to such an extent that it does not give the baby sufficient nourishment.

DR. STEPHEN RUSHMORE.—I have noticed in a number of cases in my own practice that the uterus does not seem to enlarge as it should and that the patient does not gain weight or perhaps loses a little weight and in some of these cases I have been able to detect no trouble and the patient has delivered herself at term of a live baby, so the observations to which he calls attention are susceptible of different interpretations.

DR. S. R. MEAKER presented a paper entitled **Leiomyosarcoma of the Uterus.** (For original article see page 400.)

DISCUSSION

DR. F. B. MALLORY.—The statistics of the Pathological Laboratory of the Boston City Hospital for the last thirty-three years disclose 2439 cases of

leiomyoblastoma. Under that term are included both the slowly and the rapidly growing forms. These are differentiated, according to the only criterion which we can use, that is the presence or absence of mitotic figures, into leiomyomas, 89 per cent, and leiomyosarcomas, 11 per cent. That proportion varies in different laboratories. If you do not hunt for mitotic figures you often do not see them. One laboratory found 13 per cent of cases in which mitotic figures were present.

Taking first the slowly growing forms, there are 2177, of which 1940, or 89 per cent, were in the uterus, while 237 tumors, or 11 per cent, occurred in other parts of the body. Of the leiomyosarcomas, those in which mitotic figures were present, 220 (84 per cent) were in the uterus, while 42 (16 per cent) occurred elsewhere in the body. Recently my chief assistant has been calling leiomyosarcomas, leiomyomas so as not to scare the clinicians. Of the leiomyosarcomas in the uterus, only about 1.5 per cent were distinctly malignant, invading the wall of the uterus or giving rise to the metastases. Outside of the uterus, that is in the gastrointestinal tract, kidneys, and elsewhere, a much larger proportion of the leiomyoblastomas are malignant.

The first distinctly malignant leiomyoblastoma of the uterus which I saw projected from the cervix into the vagina. It was supposed to be a blood clot, but proved to be a very rapidly growing leiomyosarcoma with tumor giant cells. In another case which grew rapidly and invaded the uterine wall, the cells varied from spindle to round, and there were many tumor giant cells. The most famous case in our series was one which was diagnosed originally at another laboratory as multiple leiomyoma. Later the patient was operated upon at the Massachusetts General Hospital for a tumor pressing on the cervical cord. Still later, an autopsy was done by one of my assistants and metastases were found in the liver, lungs, bone marrow, and also in one orbit pressing the eye forward.

DR. FRANK A. PEMBERTON.—Clinically these tumors are usually benign and the proportion of the sarcomas depends on the standards of malignancy used by this individual pathologist. At the Free Hospital for Women there were 14 leiomyosarcomas in 2991 cases of fibroids between 1905 and 1927, that is 0.6 per cent.

Our standards of what constitutes malignancy are more strict than the average. We thought six were dangerous. Two could not be traced; one had a hysterectomy and was well thirteen years later; one had a myomectomy followed by radium three weeks later and was well five years later; one had a hysterectomy and when seen eight months later had ascites, pelvic pain and evidently a recurrence; one had a myomectomy followed by hysterectomy one month after and was well a year later.

The point that interests us as surgeons is what to do at the time of operation. I believe every fibroid or fibroid uterus should be opened immediately after removal. If it is soft, gray in color, friable, frozen section should be made. If that shows the irregularities, inequalities in size, arrangement and shape of the cells and mitotic figures that Dr. Meaker has spoken of, a complete hysterectomy should be done. If the cells grow regularly, with a few or no mitotic figures, it may be considered sarcoma but if the patient is young and wants children it is safe to leave the uterus in provided she is kept under observation.

I have one patient who had radium for fibroids when she was about forty years old and nine years later she came back, having flowed a little, and I supposed she had cancer of the fundus. I did a dilatation and curettage, and examination of a tiny piece of tissue showed leiomyosarcoma. I did a complete hysterectomy and the full pathologic examination corroborated the first diagnosis.

DR. JOE VINCENT MEIGS.—I looked up the records of the Massachusetts General Hospital for the last twenty years. Out of 1433 hysterectomies for fibroids, 23 cases showed definite leiomyosarcoma or a percentage of 1.6 per cent.

In the last two years, in private practice, there have been 5 cases reported as leiomyosarcoma, microscopically malignant only, one of them from the cervix.

Of these 23 cases from the Massachusetts General Hospital, 6 patients are known to be alive and well, or 26 per cent of the number. The operations done on the 6 living patients were supravaginal hysterectomies in 4 instances, a total hysterectomy in one, and a removal of a pedunculated tumor in the other. Four patients died as a result of the operation, two of general peritonitis, one of metastasis, and one because of very extensive disease. The average life of 9 patients who died later of the disease was one and one-half years. Ten patients had had children, thirteen had not had children. Nine patients were between forty and fifty years of age and 9 were between fifty and sixty years. Sixteen patients had abnormal menstruation of some type; 12 had pain; 10 had a palpable tumor; 7 had a foul discharge; 4 reported loss of weight, and 9 were pale and anemic.

The pathologist reported 17 cases as leiomyosarcoma of the uterus, one as leiomyosarcoma of the cervix, 2 as endometrial sarcoma, and 2 as spindle-cell sarcoma. The cervix was involved in 4 patients. There were 2 leiomyosarcomatous polyps. Five patients showed metastases including the omentum, retroperitoneal masses, the bladder, intestines and peritoneum.

One case of leiomyosarcoma of the cervix was diagnosed on two separate occasions as rapidly growing epidermoid carcinoma of the cervix and was treated without effect by radium. Finally the cervix was amputated and the pathologist at last reported the tumor as a leiomyosarcoma. One patient had a large, massive recurrence in the pelvis and was given deep x-ray therapy. Two days following the last treatment she developed a large abscess which was drained and much necrotic tissue removed. Six months later she was alive and was given another series of deep therapy, again seven days after her last treatment she was reoperated upon for recurrence of the pelvic abscess, and again large tumor masses were removed from the abscess cavity. This patient has since died of the disease. One patient was given gold radium seeds in the vagina for a recurrence following a total hysterectomy without effect. In none of the living patients has x-ray or radium been used. Two cases of polypoid leiomyosarcoma seen at the Pondville Hospital (Massachusetts State Cancer Hospital) recently were given intrauterine radium treatment; both tumors have recurred and both patients have died.

DR. STEPHEN RUSHMORE.—Dr. Mallory's thumb-nail test is useful, of course, but as he would acknowledge, it is of limited applicability. The thumb-nail test might make one suspect malignancy under a number of other conditions, for example, edema. I think a somewhat more satisfactory gross test is the appearance of the tissue if examined in a good light. If we find homogeneous areas of considerable size, that is, as large as a quarter or three-eighths of an inch in diameter, without the whitened areas of the trabeculae of the fibrous tissue, we are quite certain that there is a considerable proportion of myomatous tissue there. I mean the myomatous cells will be found under the microscope in considerable abundance and these are the suspicious evidences which should be examined under the microscope and in which we are more likely to find mitotic figures. If one finds an area of an inch or two in diameter which is homogeneous in appearance, we are most certain to find sarcoma of the uterus.

BROOKLYN GYNECOLOGICAL SOCIETY

STATED MEETING, FEBRUARY 6, 1931

DR. WILLIAM C. MEAGHER reported **A Case of Large Teratoma of Ovary, First Noted Eight Years After Menopause.**

Teratoma of the ovary is by no means a rare condition. However, in this case the condition was first detected in the patient long after the menopause. According to Lynch, "it is a disease of youth and middle age," and rarely does the tumor reach the size of that found in this patient.

Mrs. C. S., white, fifty-two years of age and married twenty-five years, was admitted to St. Catherine's Hospital Sept. 18, 1930. She complained of swelling

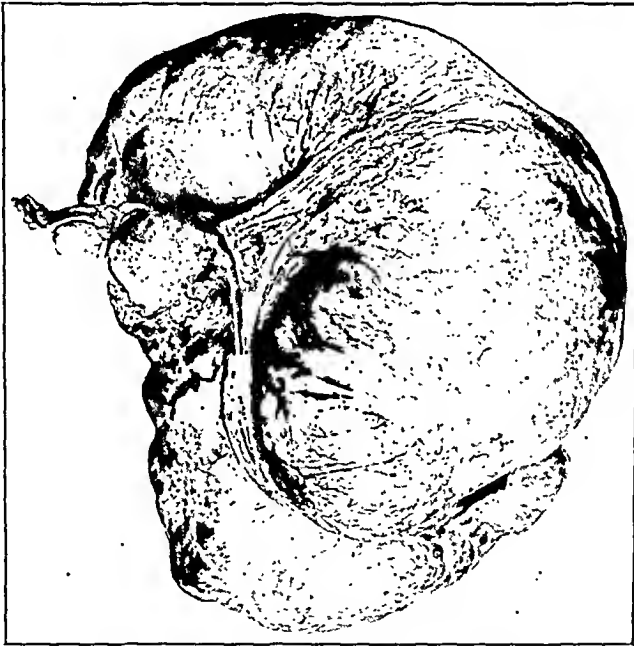


Fig. 1.—Specimen removed at operation.

of the abdomen and legs, and loss of weight for the past two years. A few months previous to admission she noted that her abdomen was gradually becoming larger and her legs began to swell. She had occasional attacks of pain in the upper abdomen on the right side. This pain did not radiate and was dull in character. She stated that she had lost a considerable amount of weight but did not know how much. She had occasional burning on urination and her bowels were fairly regular. Her menopause occurred uneventfully eight years ago and her menstrual history was negative. She complained of some dyspnea, more pronounced while lying down. Her past medical and surgical history were negative. She had one child eighteen years previously. This child was full term and the delivery and puerperium were normal. The child, however, has always been mentally

defective. She had no other pregnancies. On physical examination the patient appeared cachectic and anemic, although apparently not acutely ill. Her blood pressure was 156 over 88. Many fine crackling râles were heard in the anterior left chest, from the second to the sixth interspace at the costosternal junction. Throughout the entire chest were heard scattered râles which appeared and disappeared on change of the patient's position. The chest findings suggested a metastatic condition involving glands of the hilus of the lung or a low grade pneumonic process. Many of the transient râles were due to compression from fluid. The heart was slightly enlarged but there were no murmurs. The abdomen was enormously distended with free fluid, but there was no undue tenderness. No tympany was noted anywhere in the abdomen. A large hard ballotable tumor occupied the lower half of the abdominal cavity. The extremities were thin and emaciated but otherwise negative except for edema of the ankles.



Fig. 2.—Microscopic section of tumor showing colostrual cells.

Several uranalyses were done and all were negative. The specific gravity ranged from 1015 to 1022. Repeated blood counts showed the red cells to remain between 4,000,000 and 5,000,000 and the whites to decrease from 26,000 to 12,000 with an accompanying decrease in polys from 90 per cent to 86 per cent. The hemoglobin remained constant at 75 per cent. The sedimentation time was seventy minutes. X-ray of the chest was negative.

The patient was kept in bed until October 2, when all the chest signs had disappeared. Operation was performed on that day. An intraspinal injection of 150 mg. of novocaine was given, and a medium incision was made from a point two inches above the navel to the pubes. Three gallons of straw-colored fluid was aspirated from the abdominal cavity and a large solid tumor of the left ovary was found. This tumor was adherent, at its upper pole, to the large omentum. The uterus and right tube were normal. The right ovary was small and fibrotic. The left tube was elongated, stretching over and adherent to the tumor. The uterus

was removed supravaginally with both tubes and ovaries after separating adhesions of the tumor and omentum. Bleeding was controlled, round ligaments sutured to cervical stump, and raw surfaces peritonealized. Wound was closed in layers and a tight dressing with a large abdominal pad was applied.

The postoperative course was uneventful. The incision healed by first intention, and the patient left the hospital on Oct. 19, seventeen days after the operation.

On examination, the specimen consisted of a uterus and right tube about normal in size. The right ovary was small and fibrotic. The left tube was stretched over and adherent to a mass measuring $32.5 \times 25 \times 15$ cm. in its various diameters. This mass was solid and hard and weighed 20 pounds. Microscopic examination of sections taken from the mass showed a diffuse structure composed of glandular acini, some of which were dilated to form small cysts in which there were found cells resembling colostrum. There were also areas showing diffuse irregular growths of epithelial cells, apparently epidermoid in character. The structure was that of a teratoma.



Fig. 3.—Microscopic section of tumor showing epidermoid cells.

On January 8, 1931, the patient's condition was greatly improved. She had gained 20 pounds, there were no signs in the chest and the wound was firmly healed. Vaginal examination revealed the cervical stump to be freely movable without pain and there were no masses felt in the fornices.

DISCUSSION

DR. SAMUEL A. WOLFE: A similar specimen was reported from the Greenpoint Hospital about two years ago. The treatment in that case was simple salpingo-oophorectomy, and to date there are no evidences of local recurrence or systemic metastases.

The pathology of the teratoma is important, particularly from the standpoint of prognosis. Teratoma are bidermal or tridermal mixed tumors derived from the supposed totipotent elements in the ovary, generally the ovum. The persistence of such elements after the menopause is rare and the occurrence of the tumor just

presented at this age is rather unusual. The prognosis depends upon the degree of differentiation of the derivatives of the constituent germ layers. Judging from the slides the prognosis is evidently good. The mesodermal connective tissue and cartilage are of the adult type, and the glandular elements are all matured. Ripening of the constituent cells indicates low growth potency. The possibility of local recurrence and systemic metastasis is rather unlikely.

Usually blastomatous degeneration of mesoderm is pronounced in teratoma. The constituent cells retain their embryonal growth capacity and, therefore, rapidly proliferate, extend beyond the organ of origin and spread by the blood stream as sarcoma.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D., CHICAGO

STANDARDS OF PRENATAL CARE

PRENATAL care means the medical and other supervision of the prospective mother during the entire pregnancy. It aims to safeguard the mother and fetus by avoiding, arresting, or curing diseases which may cause death or body impairment of both or either, and to bring women to labor in physical condition adequate to withstand any necessary strain. Prenatal care is necessary to put women in the best physical condition to endure the physical and nervous strain of parturition.

Prenatal care is absolutely necessary for a considerable number of women in order to avoid calamity. It is helpful to all and its value has been amply proved. While pregnancy is a physiologic process not all women who become pregnant are normal physiologically. Just as the draft board showed the physical defects of men between twenty-one and thirty called to the draft, the reports of infirmaries and gymnasiums of women's colleges are showing that a large percentage of young women are below par physically. Moreover, a woman may have kidneys impaired by scarlet fever or other streptococcal infections and exhibit no sign of such weakness until the strain of pregnancy is thrown upon them. Tuberculosis is common, and if present it increases temporarily or permanently the hazard of child-bearing. A woman with an active or latent tuberculosis requires especial care when pregnant. Cardiac disease is relatively common and handicaps the prospective mother, especially during labor. This should be recognized early in, if not prior to, pregnancy. Women may become pregnant with unsuspected syphilis and gonorrhea. Moreover, the physically and mentally or morally unfit of both sexes may marry and beget children. While prenatal care does much good for all pregnant women, it is absolutely necessary for the types above described, and few women will be found who will admit of their own accord that they belong to any of the above named classifications. The borderline between health and disease is narrower than in the nonpregnant condition, with the result that in no field of medicine do we more frequently see women pass from apparent health into a pathologic state.

Complications of obstetric importance often exist which do not impair the health of the individual. One of the best examples of such conditions would be a contracted pelvis, which may in no way interfere with the health of the nonpregnant woman but becomes a menace to both mother and baby during parturition.

As soon as a woman suspects that she is pregnant, she should go to the physician for diagnosis so that she may be under medical supervision during the entire pregnancy. The physician at the time of the first visit should obtain a very careful history, make a complete physical examination, and record all facts in a permanent history.

History.—The family history should be carefully reviewed to ascertain if there has been tuberculosis, insanity, hemophilia, cardionephritis, or tumors in the patient's ancestors or collaterals. The type of labors among the women of her family should be studied and reviewed and all complications incidental to childbearing should be recorded. The occurrence of malformation, endocrinal disturbance, and familial tendencies should be discovered and noted with a view to determining their effect

on mother and offspring. Under the heading of *past history* the physician should set down the diseases the patient has had, the time when she had them, and whether there were complications that followed. Special care should be taken if she had scarlet fever, tonsillitis, rheumatism, chorea, sinus or antrum disease, or any other coccal infections that favor the development of cardiac or nephritic disease. The physician should tactfully ascertain if there has been the possibility of venereal infection. A separate heading should record any surgical operations, when they were performed, the name of the surgeon, and the hospital in which they were performed.

The *previous pregnancies*, labors, and puerperiums should be investigated from the standpoint of toxemia, hemorrhage, and infection, considering each pregnancy separately. One should record the duration and type of previous labors. Abortion or miscarriage should be listed under the date, the period of pregnancy, and the cause of miscarriage. In previous puerperiums one should discover how long the woman was confined to bed, and whether or not there was fever. One should ascertain the birth weight of the previous children, and their health subsequent to delivery. If any children have died, their age at and cause of death should be recorded. *Present pregnancy.* The expected date of confinement is estimated from the date and character of the last menstruation and checked by the time when nausea developed, quickening was felt and by the results of the physician's examination.

The attitude of the physician during history taking and especially during the making of the physical examination should be one of tact and such as to inspire confidence in his care, interest, ability and integrity. One should strive to protect innate modesty and keep in mind the physical and mental strain through which the woman is passing while undergoing an examination which is often the first and most intimate examination she has ever experienced. The woman should be protected from any unnecessary hurt or exposure by gentleness and proper protection by the use of sheets, etc.

Physical Examination.—A complete and thorough physical examination should be made and all facts noted and recorded. The record should show whether the individual appears normal for her age, whether she is fat and exhibits any evidence of glandular disturbances, or is abnormally thin. The description of the type of woman should be so carefully made that a stranger might be able to visualize the type of patient. The color of skin, type of hair, and any distinctive characteristic should be noted. The entire body is then examined, and special attention should be directed to the teeth and mouth, looking for evidence of infection and improper oral hygiene or previous disease. The nose should be inspected to see if there is proper breathing space. The thyroid is examined to find any abnormalities. Heart and lungs are then studied and findings are recorded. If soft murmurs are heard over the heart, the patient should be examined in both a sitting and recumbent position to see if the bruit is altered by the patient's position. Examination of heart after emotional strain is over is often advisable. The breasts are examined for the character of both the breast tissue and the nipples. The abdomen is carefully inspected and palpated and the findings noted. Vaginal examination should be made at the time of the first visit to determine the existence of a pregnancy, the position of the uterus, to discover any pelvic tumor, and to see if there is any venereal disease. Inspection of the cervix and vagina will determine the presence or absence of pathologic conditions. A smear should be made from any suspicious discharge. At this time it is well to determine the contour of the sacrum, the mobility of the coccyx, to see if the ischial spines are unduly prominent, and to outline roughly the shape of the bony pelvic wall. (External pelvimetry contributes to the knowledge of the type of pelvis, and may suggest the possibility of a contraction. The figures derived from mensuration are not so indicative of

pelvic deformity, when less than normal, as the failure to conform to the relationships one to another—i.e., 25-28-31-20 or 21 will be accepted as the normal—but, 25-28-29-20 would at once demand further scrutiny. Internal mensuration alone fixes pelvic size.) The pelvis is now measured, taking first the transverse diameter of the outlet of the pelvis, which, if small, should be checked by determining the anterior and posterior sagittals of the pelvis. This can be made readily with any one of a number of pelvimeters designed for the purpose. The length of the abdomen is measured from symphysis to ensiform to see if there is sufficient room for the fetus to be carried without undue strain upon the abdominal wall, diastasis thus causing lines in the skin. The external measurements of the pelvis are now taken, the intraspinous diameters, the intraacrestals, the bitrochanteric, and the external conjugate of Baudelocque. While the patient lies upon her side, the back should be inspected to ascertain its type. The spine should be examined with the patient in erect position or sitting. Only in case of lameness is it needful to take the oblique diameters to prove an asymmetric pelvis unless suspicion is aroused during vaginal examination. The legs are then inspected to see if varicose veins are present. The skeletal structures are examined to see if there are any changes indicative of rachitis or other osseous disease. The armpits, neck, and groin are palpated to see if there are any enlarged glands. The patient is then weighed, her height is taken and recorded, and her feet are inspected to ascertain the condition of her plantar arches. A complete routine blood count should be taken on all patients. It is surprising the number of low blood readings that will be found if this is done as a routine. A Wassermann should be taken in each individual case, and if the result is doubtful, or positive, the test should be repeated in order to avoid the chance of a laboratory error. The patient should be instructed to void before the examination and the urine should be tested for specific gravity, acidity, and the presence of albumin, casts or sugar. If albumin is present, microscopic examination of the sediment is indicated as routine to determine the presence of casts, blood, or pus.

If a pregnancy is diagnosed, minute instruction should be given to the patient on the following points in the hygiene of pregnancy.

Diet.—There is no condition in womanhood in which the diet should be as sensible and well chosen as in pregnancy. Granting that the fetus is in effect a parasite that takes from the mother's blood only that which it needs for its development, it also follows that the pregnant woman who has sufficient and proper food-stuffs in her blood stream to supply the needs of the rapidly developing fetus will endure the strain of pregnancy with the minimum amount of damage to her body tissues. One should not assume that the patient eats sensibly just because she appears strong. One should remember that the majority of primiparae are quite young women and that youth is so strong that nature appears kind. The physician should give his patient a definite diet.

A pregnant woman needs a diet so varied that she will receive necessary amounts of proteins, fats, carbohydrates, and minerals such as iron, calcium, phosphorus, and the vitamins. It should be sufficient to build up her tissue to full strength, and accomplish this without a marked storage of body fat. A pregnant woman should have enough basic foodstuffs to keep the urine on the alkaline side, while at the same time the diet should contain enough acid foodstuffs to supply protein to replace that burned by the patient's activities. A distinction should be made between tissue and nontissue proteins. The former come from flesh of all kinds and the latter from cereals, etc. The tissue proteins are probably more harmful in certain conditions, as toxemias, which arise occasionally in the latter part of pregnancy. Proteins are found largely in lean meat, eggs, fish, milk and its products, wheat, vegetables, as peas and beans. A distinction should be made between

starches and sugars, and the indications for their use and disuse are not identical. Carbohydrates are found largely in milk, cereals, breads, potatoes, rice, honey, sugar, etc. Fats are obtained in cream, butter, oils, fat meats, cream, cheese, etc.

Minerals are the chief building material for bones and teeth and with meat are an important source of supply for iron to build hemoglobin. They keep the blood neutral, the skin, hair, and eyes in good condition, and increase resistance to disease. They are found largely in milk, certain vegetables, and fruits. The best food containing calcium is milk or skimmed milk products, but it is obtainable from beans, peas, cauliflower, spinach, and dandelion greens, etc., figs and oranges. Iron is obtainable from beef, liver, oysters and spinach, and less readily from eggs, potatoes, codfish, herring, tomatoes, peas, lettuce, dates, prunes, and strawberries. The vitamins are found in milk and its products, meat, eggs, whole wheat cereals, vegetables, fruits, and cod-liver oil.

With such a wide distribution of foodstuffs in various articles of diet, meals may be selected that are appetizing as well as wholesome.

There is no reason why a normal pregnant woman should not eat meat in moderation notwithstanding old superstitions to the contrary. Modern investigation has shown that much more harm is done by using much salt as seasoning, by eating highly spiced foods and articles known to be indigestible than from eating large quantities of meat. The inclusion of meat is needed earlier, but not so much later in pregnancy. An acid type food, however, requires much basic foodstuffs to keep the body alkaline.

Cutting down sugars, sweets, and fats during pregnancy is a sensible precaution as long as there is enough fat and carbohydrate in the diet to furnish necessary energy. Bulk to combat constipation as well as supply necessary food is best obtained from vegetables and fruits. The pregnant woman, depending upon her size, should eat daily one and a half to two pounds of vegetables, weighed before cooking.

Desserts should be of fruits and not pastry. The pregnant woman should eat a grapefruit, two oranges, or an apple or two a day. Apples and prunes are usually well tolerated and aid considerably in elimination. Stewed and baked fruits are often preferable.

A normal pregnant woman should drink a minimum of eight glasses of fluid each day throughout pregnancy. Coffee and tea, and alcohol and smoking are all undesirable during pregnancy and should be cut to the minimum.

Iodine is usually necessary for a successful pregnancy, but can be given safely as a routine only by eating sea foods. Iodized salts should not be taken without special study if there is an adenoma in the thyroid. The prescribing of iodine is not necessary in all sections of the country.

There is little evidence to show that the amount of food taken by the mother greatly influences the size of the child, or that babies of excessive weight are the result of heavy eating. In former times, diets have been advanced to limit the child's weight, but these carry no conviction. On the contrary, there is much to indicate that the size of the child is controlled in large part by the woman's ancestry, or by heredity, provided always that the patient has sufficient food to keep her in good condition. Observations made in Germany during the war, as well as much animal laboratory investigation, have shown that the weight of the offspring cannot be much influenced by the amount or character of the diet, except by a diet lacking certain vitamins. A sedentary life probably increases the weight of the child much more than does the type of food, provided always that the diet is balanced and sane. Milk is an invaluable food for pregnant women. Overeating sweets, pastries, etc., should be avoided.

Weight.—The gain permitted should be influenced by the weight at the beginning of the pregnancy. By the time the patient reaches term she has gained some twelve or more pounds solely by the growth of products of conception. In addition to the gain represented above, she normally stores nitrogen, glucose, fat and other foodstuffs for use during labor and lactation.

The total weight that may be gained is still a matter of discussion. Most writers agree that twenty-five pounds' increase above the weight before pregnancy is the maximum amount that is usually desirable. Yet more important than the total amount gained is the rate at which it is acquired. Sudden gains of five pounds in one month are more likely to portend metabolic disturbance than to suggest a favorable condition. Sudden increase of weight is often due to edema which may not quickly show in a stout woman. A regular gain of two or three pounds monthly is desirable. Pregnant women do not usually gain in weight during the last two or three weeks of pregnancy under normal conditions.

If the patient does not gain in weight during pregnancy there is likely to be some abnormal condition, since failure to gain means actual loss of the ten or twelve pounds represented by the products of conception. Excessive gain during pregnancy or failure to gain at all requires investigation. Athletes strive to attain the optimum weight by appropriate diet, exercise, and systematic training.

Exercise, Rest, and Bathing.—It is difficult to specify the exact amount of exercise, rest, and bathing that a patient should take. It is a safe rule to urge her to take all the outdoor exercise that she can without causing fatigue. Yet exercise in pregnancy should depend largely upon the habits of the individual. It may be as much of a mistake to urge a woman of sedentary habits to force herself to take exercise that causes fatigue as to restrict the athletic woman in the exercise to which she has been accustomed. If a woman is accustomed to playing golf, there is no reason why she should not do so to a limited extent at least for the first part of her pregnancy. If she is accustomed to swimming, the same rule holds, but stunts and diving should be avoided. Bathing in rough waters should be interdicted. While the ordinary woman may safely drive her automobile for short distances for marketing or for calls, automobiling as a sport should be forbidden. One of the frequent causes of abortion is long automobile and railroad journeys.

Easy gardening is a good form of exercise and diverts the mind, but must be done as an amusement and not as a duty. Yet the physician must remember that the woman should come to labor with well-developed legs and a muscular back, and keep ever in mind that in many ways his duties resemble those of an athletic trainer. The patient should be warned against lifting children or heavy objects, and advised not to assume positions of muscular strain while the hands are elevated above the head. She should be cautioned against hanging curtains, or riding with her hands in the strap of a street car for avoidance of abdominal strain.

In the early months of pregnancy, the ordinary patient is apt to fatigue easily. She cannot sleep too much. She should take daily naps. The formation of the siesta habit will help the pregnant woman get more quickly through the discomforts of the first months. Sleep is not essential to the daily rest, but the clothes should be loosened so that the patient may relax thoroughly. Even in the early months of pregnancy if she is going out in the evening she should take an afternoon nap. She should sleep in a well-ventilated room with the windows open to assure plenty of fresh air. Her sleep should be restful. This often proves difficult because she may be awakened by digestive disturbances, a desire to void, or in the later months of pregnancy because of difficulty in breathing. Sodium bicarbonate is helpful. A woman unaccustomed to sleeping on pillows may find in the later months of pregnancy that it is desirable to use even two or three.

The ordinary woman takes too many baths. Hot tubs daily are likely to be more productive of fatigue than comfort. Tepid baths with cold spongings may be taken frequently, but baths extremely hot or cold, Turkish or cabinet baths, hot sitz baths, and surf bathing are likely to invite disaster. During pregnancy the skin is said to secrete more than at other times. Sea salt baths often tone the skin but should not be taken if the patient feels exhausted. They often check the profuse sweating, which is an annoying symptom. Light massage, general except for the abdomen, is very helpful and soothing. In the last weeks of pregnancy tub baths should not be taken because of the chance of carrying polluted water into the vagina and favoring infection. Showers or sponges alone should be used. Vaginal douches should be forbidden unless indicated by disease. When given they should contain only mild antiseptics, given in tepid water and under low pressure. The top of the bag should never be more than twenty inches above the douche point. Vaginitis should be treated thoroughly to avoid the danger of puerperal infection. The douche bag and point, and all solutions employed should be boiled before using.

Bowels.—Constipation is common during pregnancy since the gravid, enlarged uterus is likely to interfere with normal peristalsis. A long standing habit of constipation cannot be cured in a short time. Drugs are necessary. The bulky vegetable diet often aids in securing bowel movements, especially if the patient attempts to develop an unailing habit at a definite hour following a meal. Bran in bread and biscuits may be used but too much roughage may cause colicky intestinal pains. She should also take mineral oil or petrolagar in small doses daily after each meal. This habit should be maintained throughout pregnancy if the stomach remains settled. If this medication does not give successful results, she may use prunes, figs, or dates with senna, made according to formulas widely known among the laity. The use of strong cathartics is inadvisable except for definitely indicated morbid conditions. The occasional use of cascara, pills with aloin, belladonna and strychnine, phenolphthalein or mild salines ordinarily may be advisable. Yet if the individual persists with the use of petrolatum and uses medication only when the bowels have not moved, she may develop a regular habit during pregnancy. Euemas should be avoided, but if necessary, a small oil enema is the best.

Kidneys.—The kidneys probably are one of the most vulnerable tissues in the body during pregnancy, hence the urine should be examined frequently by the physician. The urine should be examined monthly for six months, every two weeks during the seventh and eighth months, and weekly during the last month of pregnancy, even in the absence of symptoms. The patient should send a four-ounce bottle of the first sample voided in the morning to the physician, and should measure once a week the 24-hour amount. If this does not exceed 1500 c.c. the patient should drink more water. Edema may necessitate changes in fluid intake.

Teeth.—There is an old saying "for every child a tooth," based largely upon the popular belief that the fetus takes calcium from the mother's teeth and bones. While this condition may hold true in very limited extent, there is little evidence for the belief that it does so as a rule. Teeth decay more often from an upset stomach which alters metabolism than because the child is withdrawing fixed calcium from the mother's bony tissue. Oral infection is often overlooked and should be investigated. The care of the teeth is most important during pregnancy and the technic of proper dental hygiene should be carefully explained. Teeth should be brushed from the gum toward the biting surfaces and with a hard short brush that has not been wet save with the dentifrice. The gums should be massaged with the brush to stimulate circulation in the tit-like processes which jut down between the teeth. Scouting of the teeth from side to side is harmful. The teeth should be brushed upon arising and when retiring, as well as after each meal. Saline washes

with lemon juice make a good substitute for tooth paste. The mouth should be rinsed with an alkaline wash several times a day.

Breasts.—The breasts should receive attention early so that the woman will have every chance to nurse her child. Massage is useful. The entire breast should be moved upon the chest wall, holding the mamma firmly in the hand. This type of massage stimulates the circulation of the breast. It should be done daily. Small and underdeveloped nipples sometimes may be elongated by traction with the fingers or with a breast pump. Nipples that show signs of fissures may be softened with lanolin, cocoa butter, or mineral oil, a procedure which tends to make them more elastic. Other solutions are useless. The skin cannot be hardened with alcoholic preparations. Wooden or lead nipple shields sometimes help the development of small nipples. It is worthy of trial. The outlook is gloomy, however, for making retracted nipples serviceable by any known methods of treatment.

Intercourse During Pregnancy.—In healthy persons sexual intercourse does no harm as long as the abdominal enlargement is not great. It should be forbidden, however, in the last six weeks of pregnancy since it may cause puerperal infection. The patient should be made to understand the danger. If the patient has shown a tendency to abortion or premature labor, coitus should be interdicted. That nature wishes to discourage intercourse during pregnancy may be inferred from the fact that most women lose desire after the fourth or fifth month.

Maternal Impressions.—The laity believe that the child may be marked because of some terrifying sight seen by the expectant mother. There is no doubt that profound mental emotion occasionally causes abortion or premature labor. Yet there is no evidence that a child can be deformed because the mother has been frightened. In the first place there are no nerves passing between the mother and the child in the uterus, so there is no tract by which mental and nervous impressions may be conveyed. The only communication between the two lies in the interchange of materials of nutrition and excreta through the placenta. The mother's blood never enters the child and the two circulations are separate and distinct. Nature probably by thus erecting barriers between the mother and child has specially provided for the protection of the fetus from injury. If this were not true, many children would suffer because of mental emotions of the mother. Nine months is a long interval of time, one in which a patient can run the gamut of mental strain. Many physicians have seen hundreds of women who felt their child would be marked because of mental stress or fright they had endured, yet rarely have they seen a fetal injury which could be so explained. The child is completely formed at the end of the sixth week, at a time when pregnancy is not usually recognized. Most of the cases reported as maternal impressions have injuries that developed weeks before the fright occurred. Moreover, all monstrosities observed in the human being are found in lower orders of life and in much greater number. Yet the theory of maternal impressions has not generally been extended to apply to lower animals.

Preservation of the Figure.—The thoughtful physician will do all that he can to leave his patient unmarred physically by pregnancy or labor. More can be accomplished by prevention than by corrective exercises later. Yet at best the physician's opportunity is limited. He cannot prevent the collapse of the breasts that occurs after the woman has weaned her infant. Uplift brassieres, now fortunately in vogue, tend to keep breasts from sagging, but patients with large busts are apt to present themselves in their first pregnancies with breasts that have been held down by years of tight lacing. The massage of the whole breast and emollients may help in preventing the skin striae that show when a breast enlarges more. Corsets and proper support of the abdomen are often desirable.

The measurement of the length of the abdomen often is of value to the physician. If it is less than 30. cm. the skin is likely to break and present striae in the last weeks of pregnancy unless the head sinks in the pelvis early and prevents the uterine fundus from becoming markedly pendulant. Cold creams often soften the skin and make it more flexible, and proper maternity corsets aid in preventing undue extension. Yet the physician's opportunity for preventing an enlarged abdomen is somewhat limited. The uterus in the short abdomen is shoved forward because there is not enough room for the gravid uterus and intestines and because of the increased angle of the superior strait which is the rule with short abdomens.

Much can be done in keeping the patients from becoming obese. Far more can be done by prevention than in aiding her to reduce after she has become obese and abandoned nursing. An enlarged abdomen, however, is the rule in all short waisted women after parturition.

The legs should be routinely inspected to find varicose veins in their earliest stages. Elastic stockings worn throughout the day may prevent their developing.

Proper exercise, chiefly walking, tends to help the muscular tone and balance of the woman.

Clothing.—Fortunately women's clothing is now sensible and needs little adjustment during pregnancy because nearly all apparel hangs from the shoulders. Women with large breasts have in the past laced them down with tight brassieres. The proper treatment of such breasts is elsewhere outlined. Tight circular garters should not be worn. They retard the circulation of the veins and favor varicosities in case the venous musculature is not strong. Shoes, however, are not sensibly shaped. Spiked heels give inadequate support. The woman is likely to turn her ankle. Moreover, they elevate the heel unduly and tend to increase the sway of the back. Properly fitting shoes should have a broad heel support. The Cuban type of heel is as elevated as should be permitted. If a woman will wear flat heels, she should be encouraged to do so.

Routine follow-up during pregnancy and postpartum is a professional obligation. Patients should be seen and examined by their physicians at least once each month during the first five months unless they present complications, in which event they must be seen more frequently. They should be encouraged to report any condition that they do not understand. The patients should report for the same routine examination once every three weeks during the sixth and seventh months, once each two weeks during the eighth month, and once a week the last month. At each time the urine should be taken and examined. The blood pressure should be taken and recorded on each visit, and the patient weighed. Once a month she should have a hemoglobin reading of the blood. If the patient is anemic, a complete blood count should be done. In the eighth month of pregnancy, the pelvis should be again measured in the same manner as before, and at this time the diagonal conjugate should be taken and recorded. Abdominal examination is of great importance in determining the rate of uterine growth and the condition of the fetus. It should be done routinely at each visit. The development of the pregnancy is ascertained by abdominal palpation and by vaginal examination. Vaginal examination should not be made as a monthly routine unless indicated. During the last two to six weeks the fetal head should settle in the pelvis if the woman is primiparous and if the abdominal muscles are normal and the length is average. Breech presentations are not likely to engage. Women with abdominal measurement as long as 35 cm. frequently do not show engagement until immediately before labor. The reason for this is clear. There is abundant room for the entire fetus to be carried in the abdomen in such patients without causing strain upon the abdominal viscera. The upper pole of the uterus is displaced to the right side of the abdomen because the liver does not change shape, while the stomach is

constantly filling and emptying and is more likely to resent crowding. Women of short abdominal length carry the upper pole of the uterus far forward and have a pendulous abdomen. If the pelvis is normal there is no disproportion between the pelvis and fetus, the head will engage early. Each patient must have careful individual study during pregnancy. The physician should be able to recognize a disproportion before the onset of labor. If the head does not engage, he should see if it can be made to engage by pressing it down into the pelvis, at the same time seeing if there is any suggestion of overriding. It is a mistake in art to neglect the pelvic measurements and rely upon the test of labor to see if the child will come through. There are many reasons for failure of engagement besides absolute disproportion. If there is marked disproportion, the head will override the symphysis. Minor disproportions lead to difficulty when the head is jammed into the pelvis with the moulding, and it should be remembered that the head may enter the inlet and not emerge from a small outlet. Overriding is only one of the signs of disproportion and both its apparent presence and absence may be misinterpreted.

Minor Discomforts of Pregnancy.—There are a number of minor complications of which a woman will frequently complain. Treatment should relieve them.

Ptyalism occurs not infrequently and is often associated with nausea and vomiting. It is sometimes a very disagreeable and unpleasant symptom. The control is often difficult. Alkalies tend to inhibit salivary secretion.

Heartburn: Heartburn has of course nothing to do with the heart, but is occasioned by hyperacidity or fermentation. There are bitter eructations of clear fluid. It occurs most commonly in the last months of pregnancy and usually can be averted by taking a teaspoonful of bicarbonate of soda immediately after a meal. Milk of magnesia or brick of magnesia often works when soda fails. Avoiding acid drinks and rich or spiced foods does much to limit this discomfort. Usually there is some dietary indiscretion.

Fainting: Many women faint in pregnancy or lose consciousness for a moment. Usually they become pale, but not necessarily, and the pulse may or may not be affected. These spells usually follow indigestion and as a result they are not uncommon in the first months of pregnancy. Smelling salts or aromatic spirits of ammonia are proper stimulants.

Cramps: These appear in later pregnancy. They are due to muscle strain in Nature's effort to maintain the body balance as the center weight shifts forward because of the enlarged abdomen. In consequence there is continual muscle strain. Cramps usually come in the legs, and most often in the night. They may waken the patient. Massage gives relief. The fact that they are due to muscle strain suggests that the patient should wear proper shoes. If the physician follows the changes that the planes of the pelvis make during pregnancy the reason for cramps becomes perfectly clear.

Varicose Veins: These develop most often in the legs, but may come behind the knees or upon the thighs. They are seen in women who have poor musculature of the veins. The exciting cause is pressure in the abdomen. The appearance of varicose veins indicates a long train of trouble and discomfort. Treatment should be started as soon as the veins appear to be enlarged. Ordinary bandages usually do not relieve. It is a mark of wisdom to order an elastic woven bandage as soon as the veins first show. Elastic stockings may prevent varicosities from becoming disfiguring. The complaint cannot be controlled by elevating the feet. The veins do not completely disappear after a pregnancy. They are not infrequent on the vulva and may be very troublesome.

Hemorrhoids: Hemorrhoids are varicose veins in the rectum. While due frequently to increased abdominal pressure, they occur most often in women who are chronically constipated. When they bulge through the anus, they are likely to become strangulated and cause exquisite pain. Often they can be relieved by a cold water or witch hazel compress to the anus after the bowels move, held in position for five minutes while the patient is lying down. If the bowels are kept open, the condition may improve, but rectal suppositories are usually indicated before very long. Operations should be done only as a last resort.

Leucorrhea: Most women have leucorrhea in pregnancy; it represents seepage from the vagina. It is ordinarily pale yellow in color, and thin. It may cause irritation to the skin. Bathing with mild solutions of soda bicarbonate may help the itching. Bran baths are also a popular remedy, but if the leucorrhea is marked it may require douches and local treatment. Fortunately, however, this is necessary only at very rare occasions.

The patients should be given personal advice and printed directions for care during pregnancy. Pamphlets are much better for them than the books on maternal care which are likely to go much into detail concerning points the women might as well not know. Yet a proper list should warn the women about the early development of unfavorable conditions. The symptoms which should be listed as warning signals are as follows:

1. Marked nausea and vomiting.
2. Bleeding.
3. Continuing or recurrent headache.
4. Visual disturbances.
5. Dizziness.
6. Pain in the epigastrium.
7. Edema, especially of the face and hands.
8. Shortness of breath.

Nausea and Vomiting of Pregnancy: This complication, if taken early, is usually controlled by proper diet and elimination. Small and frequent feedings at two- to four-hour intervals usually cures the mild cases, especially if fluid is not taken with meals. The more liquid the food is, the more likely it is to be vomited. Water especially is not well borne. Water had best be given one hour after meals, while the patient is lying down, with a hot water bag at the pit of her stomach, or else by a retention enema of eight ounces two or three times a day. The bowels are regulated by the employment of mild laxatives. Antacids frequently help, soda bicarbonate, magnesia, or citrocarbonate. Two types of diet are advanced, one rich in carbohydrate and the other in meat proteins. Both types of diet get results more by keeping food in the stomach than by virtue of the character of the food. In case the vomiting persists and comes on frequently, the patient should be sent to a hospital and treated according to one of the many recognized routines. Therapeutic abortion is rarely indicated and should not be done as a first resort. Bromide in starch water given by rectum aids greatly in the control of the disagreeable symptoms but should not be given to the patient to take without constant medical supervision.

Abortion and Premature Labor: A normal woman is not likely to abort if the implantation of the ovum is normal and firm. In the majority of early abortions, the fetus is pathologic. That spontaneous abortions are common, however, may be surmised because many authors have estimated that 10 per cent of pregnancies abort from other than instrumental causes. There is very little we can do as prophylaxis against underlying or predisposing causes of abortion. Complete rest is our main anchor. When a pregnant woman bleeds, she should be put to bed

and every effort made to keep her quiet. If pain follows the bleeding, there is very little chance of arresting the impending labor. Many patients who bleed, even in early pregnancy, have a low implantation of the placenta, some type of placenta previa. In the early months this does not constitute a formidable condition, but later in pregnancy it may be a serious threat to life. Consequently one should not examine a bleeding patient during the second half of pregnancy unless one is prepared to institute immediately any necessary obstetrical procedures to control the case. Vaginal examination, therefore, should not be made at home unless the physician is surgically clean, the patient properly prepared, adequate help present, and any instruments and equipment that might be used at hand. Misplacement of the uterus has been described as a common cause of abortion, a statement for which there is no proof. Women abort because implantation is faulty, because of actual trauma, or because the ovum is diseased. Women who in the past have aborted should be kept in bed for a week at the time when they would have been menstruating had pregnancy not occurred.

Toxemia: Persistent edema may give warning of a developing toxemia long before there is elevation of the blood pressure or changes readily recognized in the urine. The tissues of the body are more succulent in pregnancy than in the nonpregnant condition. There is always some edema present even though it does not show. This may be due to mild toxemia which accompanies every pregnancy, even in the absence of symptoms. Edema of the feet may be due in part to pressure of the fetus upon the large blood vessels, but nearly every woman complains that the fingers are swollen and stiff before she comes to delivery. Many women have some swelling of the face. When there is actual and recognizable toxemia, the blood pressure almost invariably is high, but the diastolic rate does not always rise as much as that of the systolic. The changes in the diastolic pressure are probably of greater significance than the more variable and less stable systolic pressure changes. These readings are a very important part of the reported prenatal examination of the prospective mothers. If a woman whose blood pressure during pregnancy has been 105 systolic reading reaches 130, there is a cause for treatment. Rest in bed for a week or more, increased elimination through bowels and kidneys, low protein, salt-free diet are proper therapeutic means. Sweating is useless. Blood chemistry observations give little aid. The urine usually shows a trace of albumin; casts appear later. With the appearance of casts, the presence of albumin, and a rise of systolic blood pressure above 150, the physician should carefully review the case and seriously discuss with himself the question of interruption of the pregnancy. The period of gestation is very important in reaching this decision. One would induce labor at or near term for lesser indications than at seven months.

Cardiac Disease: Women with diseased hearts rarely decompensate during pregnancy unless the heart has previously broken down. If they present such a history, they decompensate usually early in pregnancy if there are nausea and vomiting and other signs of toxemia; otherwise decompensation is delayed until the abdomen is crowded by the growing fetus. Rest in bed and cardiac tonics are urgently needed. Dyspnea occurs only in severe cases. Fortunately most women with cardiac lesions deliver without much difficulty. They rarely break down in the first stage of labor if they have not decompensated before. The child should be delivered as soon after dilatation of the cervix as the obstetric conditions permit. If cesarean section is indicated, which is comparatively rare, it should be done under local anesthesia, and the tubes tied and cut, for which procedure the physician should receive a demand signed by both husband and wife to warrant his doing it.

Syphilis: Frequently the physician is greatly surprised when he receives a positive Wassermann reaction from the blood serum of a woman who appears absolutely normal. There is disagreement as to what should be done in such event unless the

reaction is well pronounced. While slightly positive Wassermann reactions may result from some metabolic disturbance in pregnancy, there is no doubt that a four-plus Wassermann indicates only syphilis. In case of doubt it is safer to treat for the disease than to omit this wise precaution. Intravenous injections of arsphenamine should be given for a course of twelve to twenty doses, followed by six weekly injections of mercury. If the Wassermann reaction then remains positive, which it occasionally does, the same course of treatments should be repeated after an interval of two weeks. One should be very cautious about the use of arsenical preparations late in pregnancy. Mercury and bismuth preparations are much safer. Such therapy does not cause miscarriages or premature labor, but tends to prevent or cure syphilis in the fetus. Before beginning injections, one should take the husband's Wassermann. Patients of this type must be most carefully and tactfully handled.

Tuberculosis, diabetes, goiter, and contracted pelvis must all be considered and investigated and carefully treated.

Abnormal Presentation: Abnormal presentations should occasion great concern. If the child lies in breech or transverse, it should be turned to vertex by external version whenever possible, even though it may prove impossible to maintain the converted position. A fetal head that is overriding the pelvis is a serious condition. The pelvic measurements should be checked and attempt made to force engagement before a cesarean section is done. If the abdomen is large, twins should be excluded. And when amniotic fluid is developing rapidly, one should entertain a suspicion that the child may be deformed. Roentgen ray in these cases occasionally gives a diagnosis. The thoughtful physician will protect himself by warning the father that there may be trouble with the child.

Multiple pregnancy, abnormal presentation, and monstrosities can be diagnosed by x-ray and should be carefully investigated as possible complications. X-ray probably may do more injury early in pregnancy than later. The amount used for taking pictures should not be harmful unless used excessively.

The physician must keep in mind that a pregnant woman needs routine care. The desire for such care is evidenced by agitation in all women's clubs throughout the country and the passage of laws displeasing to at least a considerable percentage of medical men. If a physician accepts pregnancy cases, he must accept the entire responsibility. If the patients are not able to recompense him sufficiently for the many necessary services, they should be directed to other sources where they may have the care that every pregnant woman needs.

Prenatal care is in line with the propaganda for periodic health examination, both of which stress the necessity for proper follow-up of the case with intelligent supervision.

It should be stressed that proper prenatal, intranatal, and postnatal care go together and each makes up a part of an integral whole.

Department of Book Reviews

CONDUCTED BY ROBERT T. FRANK, M.D., NEW YORK

REVIEW OF NEW BOOKS

For years Dr. Willy Meyer has made an extensive study of the literature on cancer as a result of which he adopted the tenets of the non-specific theory of cancer. Most of the first part of this book¹ on the origin, the development, and the self-perpetuation of cancer has already been published as papers in various journals and this material has here been expanded to take care of recent work. To all chapters is appended a significant bibliography. Dr. Meyer discusses at length the subject of predisposition through systemic chronic irritation. From a biochemic standpoint he feels justified in insisting that a condition of alkalosis indicates a predisposition to cancer. To counteract this overbalancing effect of the salts of alkaline metals to those of alkaline earth, he has exhibited calcium as the antagonist of the sodium and potassium salts, or by other means has produced an acidosis. He considers further the effect on the dead cell, and the focal and systemic effects of solutions of dead cells, necrone solutions. He develops his conception of an imbalance of the nerves, endocrine glands, serum salts and the psyche, as constituting a systemic chronic irritation, deals with the part modern civilization, increasing age and heredity plays in predisposition. In the discussion of the self-perpetuation of cancer he regards the lungs and lymph system as reservoirs of cancer cells and treats of the part the lymphatics take in a glandular defense against metastasis.

Based on the premises which he has developed in the first part of the book to bring forth his concept of the cancer problem he elucidates in the second part his proposed therapy, the various means by which the etiologic factors may be reduced or eliminated. Aside from surgery and radiation which he does not discuss in a technical manner, he suggests that radical operation or palliative operation, raying, depending upon the stage of the condition met, should be followed in every instance by systemic treatment, consisting in most painstaking postoperative therapy and continued observation.

To this end Dr. Meyer feels that equally important as a removal of the tumor is the destruction of cancer cells enmeshed in the lymphatics. In order to accomplish this an acidosis must be produced or, at least, a lowering of the degree of alkalosis prevailing in the body fluids of the patient. He suggests the production of fever and cites cases beneficially affected by continued fever. As an agent to produce such continued fever he advocates the use of repeated injections of Coley's fluid. Cases are cited illustrating this point. It seems remarkable that Dr. Meyer uses Coley's fluid in treating cancer, basing his therapy on a non-specific theory while Coley himself, and others, Sir John Bland Sutton, for instance, adhere to the parasitic theory of cancer and use Coley's fluid as a therapeutic agent under an entirely dissimilar premise. A study of the hydrogen-ion concentration of the serum, Meyer states, has shown that if a relative acidosis of sufficient degree is produced to reduce the serum pH to the normal value a cure, quite definite, can sometimes be obtained. Further chapters on therapy describe various other methods of producing acidosis particularly with reference to calcium medication.

¹*Cancer. The Therapy of Operable and Inoperable Cancer in the Light of a Systemic Conception of Malignancy.* By Willy Meyer. New York, 1931, Paul B. Hoeber, Inc.

Dr. Meyer's views are personal, they are the result of a long continued study of literature and persistent clinical observation of many cases for years. Whether or not his theories are agreeable to research workers in cancer, the fact remains that any influence in the fight against cancer, prophylaxis, or cure, must be considered in a broad sense as helpful.

—Philip F. Williams.

Dr. Reed presents the subject of *Operative Obstetrics on the Manikin*.² The evolutionary trend of obstetrics and the increasing hospitalization of maternity cases seems to be leading more and more toward operative interference in labor. If such is the case it is well to have the subject presented not only for the student but also for the general practitioner and junior group of specialists in such a clear and effective manner as it is here given. Pelvimetry, fetometry and the maneuvers of normal delivery precede an excellent discussion of forceps operations, breech extraction and version. Operations not possible on the manikin including the various types of cesarean section and the repair of injuries to pelvic structures at birth are considered in detail, while the operative treatment of various types of hemorrhage forms a separate chapter. The book closes with a set of standing orders for mother and child, and suggestions for maternity hospital interns which might well serve as an outline in any maternity. The illustrations, although for the most part from other works, are suitably chosen.

Although practically all the text appears here and there in the average standard book on obstetrics yet its compilation in a small easily handled volume serves to make the book much more useful for ready reference, and its presence in the obstetric satchel might be welcome in a time of need.

—Philip F. Williams.

Dr. Konikow feels that her personal experiences with 758 women whom she has advised as to "volitive eugenics" have been sufficiently valuable to warrant her in a presentation of this book.³ She discusses all the methods available from various angles and gives her reasons for choosing the measures she considers most applicable for the average case. One pertinent bit of advice to physicians prescribing such methods is that they should explain to patients any possible reasons for partial or relative sterility which they may find during an examination. On her printed record form appears a space for "Reasons for Refusal to Give Contraceptive Advice"; it would have been interesting if Dr. Konikow had included even a small paragraph as to when and why she has refused any patient's request since, according to the long statistical tables she presents, no woman applying to her for contraceptive advice seemingly was refused. She gives a rather naïve explanation for the attitude of the Catholic clergy toward the subject of limitation of offspring.

Of more interest than some other parts of the books are the sections devoted to the subject of temporary sterilization by the x ray, and to the work of Haberlandt with injections of ovarian and placental products for temporary sterilization of female animals. She refers also to the recent work of Naiditch in the Soviet Institute for Experimental Endocrinology. Naiditch finds that repeated injections of dead bull sperm have produced in women a sterility lasting from two to twelve months, the average dose being five billion sperm cells in ten cubic centimeters of diluting fluid.

For anyone who is not familiar with the methods of contraception, this book offers a full presentation of the subject.

—Philip F. Williams.

²*Operative Obstetrics on the Manikin*. By Charles B. Reed. Philadelphia, 1931, P. Blakiston's Son & Co., Inc.

³*Physicians' Manual of Birth Control*. By Antoinette F. Konikow. New York, 1931, Bushholz Publishing Company.

This final, deeply felt bit of writing⁴ of a famous scientist leaves to posterity an unperishable part of himself. The practical philosophy of life, so simply and delightfully presented here, will keep alive for many of Warthin's former students the memory of a beloved teacher.

—Philip F. Williams.

Dr. Karl Abel offers a set of ten pocket size pamphlets on obstetrics and gynecology⁵ for the general practitioner, based on lectures given in postgraduate courses. With their help the busy physician may quickly orient himself on any subject, and see what is practical of the new advances. Any individual pamphlet in the series may be purchased separately. The first pamphlet discusses Embryology and Anatomy. He develops constantly the practical relationship between anatomy and clinical practice; embryonal rests and the formations which may develop from them, innervation and application of local anesthesia; the medico-legal aspects of the difference between decidua and chorionic cells in questionable pregnancy; and the relationship of the ureters to the pelvic organs in disease and operation. The second pamphlet sets forth the Physiology of the Pelvic Organs. He believes sex education should be begun at home by the mother and that birth control and allied questions are in the province of the physician and individual patient. The third pamphlet discusses Gynecologic Examination and Changes in Menstruation. It is rather hard to agree with Abel, that the nonpregnant cervix may be dilated as easily as he describes, and that submucous fibroids and corpus carcinomas can be palpated and recognized digitally. The fourth pamphlet on Changes in Position, and Inflammations of the Uterus is a concise practical presentation of the current practice. The fifth pamphlet dealing with the Tumors of the Uterus briefly and clearly gives the high points of our present knowledge. Abel states that German operators are turning more to vaginal hysterectomy than to abdominal radical operation for carcinoma of the cervix and that roentgen-ray postoperative therapy is systematically used. The indications and technic for radium are detailed. The sixth pamphlet on Diseases of the Adnexa, and Appendicitis in Women reveals a remarkably conservative attitude to the one and a radical attitude to the other. The seventh pamphlet, External Genitalia and Vagina, and Gonorrhea in Women is an excellent treatise of the subject. In discussing Abortion, the subject of the eighth pamphlet, Abel does not hold a brief for any social or eugenic indications for therapeutic abortion, a sound viewpoint when one considers the present furor in medical circles in Germany over the proposed revision of paragraph 218 of the penal code relating to abortions. In the ninth pamphlet, Pregnancy, Labor and Puerperium are handled in a novel manner. Realizing the extraordinary difficulty in discussing such an enormous subject within such a small space, he has arranged the material as a lexicographer might. So alphabetically in either a line, a paragraph, or a section he carries one through the entire subject from *Abnabelung des Kindes* to *Zwillingsschwangerschaften* with trite, concise comments. In a similar manner he has handled the Therapeutics of Gynecology and Obstetrics in the tenth and final pamphlet. One is amazed at the number of proprietary preparations and biologicals suggested. There are numerous excellent formulas which are written out in the form of prescriptions with directions, also a list of the springs and baths of Germany.

There can be no doubt but that these booklets well fulfill their intended purposes.

—Philip F. Williams.

⁴*The Creed of a Biologist*. By Aldred Scott Warthin. New York, 1930, Paul B. Hoeber, Inc.

⁵*Gynäkologisch-Geburtshilfliche Taschenhefte für den Praktischen Arzt*. By Karl Abel. ¹⁰Hefte. Berlin, 1931, Otto Enslin.

The pupils of Paul Lecène, former surgeon to the Hospital Saint Louis, Paris, begin with this volume⁶ a series of monographs, as memorials intended to perpetuate the clinical teaching of their chief who had such a work in preparation at the time of his death. This volume, *Generalities* by Pavie and *Lesions of the Breast* by Moulonguet forms the first of the *Anatomico-Clinical Diagnostics of Paul Lecène*.

Dr. Pavie discusses the relationship of the clinical surgeon to the clinical laboratory. He deals with serology, bacteriology and inoculation of animals, biopsy, recommending Bouin's fluid as the fixative in current use in the Hospital Saint Louis, and with gross and microscopic examination of tissue removed at operations. It is interesting to find that a photograph of the gross specimens as well as photomicrographs form a part of the patient's history in this institution.

Dr. Moulonguet gives a very thorough presentation of lesions of the breast. The Infections, under which he classifies galactocoele as a chronic abscess, the Dystrophies, Hypertrophies, Engorgements, Cysts, the Neoplasms of the breast, benign and malignant. Of particular note is the section on Paget's disease, beautifully illustrated with many photomicrographs. The subject of cancer is discussed quite extensively from a clinical and anatomical standpoint. The author does not mention radium or x-ray in treatment, stating that surgical removal is the only efficacious method of handling cancer of the breast. Moulonguet mentions that Lecène in his long experience never encountered a case of syphilis or actinomycosis of the breast.

One may warmly recommend this monograph in anticipating the appearance of the future numbers.

—Philip F. Williams.

This book,⁷ *Ideal Marriage*, its physiology and technic, is the first part of a *trilogy*. Van de Velde treats in it with the sex basis of married life and this volume will be followed by two others bearing on conjugal aversion, and sterility in marriage.

The book is divided into four parts. The first part deals with the general physiology of sex, with particular reference to the part certain stimuli, internal secretions, and external sensations, as perceived by the organs of sense, have to do with the origin and development of the sexual impulse. The second part deals with the anatomy of the male and female reproductive organs and with their general physiology and specific function as sex organs. The third part deals with the physiology and technic of sexual intercourse in a remarkably sane handling of a difficult topic. The fourth part deals with the Hygiene of Ideal Marriage, probably the most practical part of the book. The scientific character of the book and the author's treatment of the whole subject is in marked contrast to the manner in which many books on the same theme have been presented. There are many suggestions of a practical nature in the fourth part of the book which a physician could give to his patients providing the discussion of the marital relation reached a sufficiently wide latitude. Sex education has always been a difficult problem and sexual education is even more difficult because of the intimacy of the topic. However, to those to whom questions of this nature are presented this book may be of value.

—Philip F. Williams.

Embued with a contemplative philosophy regarding obstetrics, Doctor DeGaris has evolved a new definition of normal labor upon which his *Theory of Obstetrics*⁸

⁶*Les Diagnostics Anatomico-Cliniques*. By De Paul Lecène I, *Généralités* by P. Pavie, *Lesions Du Sein* by P. Moulonguet. Paris, 1930, Masson Et Cie.

⁷*Ideal Marriage, Its Physiology and Technique*. By Dr. Th. H. Van de Velde, Translated by Stella Browne, Introduction by Dr. J. Johnston Abraham. Coviel, Friede Publishers, New York, 1930.

⁸*The Theory of Obstetrics, A Functional Study of Childbearing*. By M. C. De Garis, M.D. William Wood and Company, New York, 1931.

is based. He discusses here the pathologic influences which interfere with normal labor and so oppose his theory. He analyses his own obstetric practice in the light of this theory with some interesting conclusions, makes a plea for more intensive case criticism, and suggests State research upon some important problems of maternity.

—Philip F. Williams.

This clearly written monograph⁹ is much more comprehensive than its title, Hemorrhage and Leucorrhea, would indicate.

It is one of a series of small monographs on various subjects to bring to the practitioner the latest advances in science and practice. Runge has developed in a very thorough manner the current concept of menstruation, and its relationship to the glands of internal secretion. After considering the changes in menstrual bleeding the causes of bleeding from the uterovaginal tract, including such general conditions as blood dyscrasias, are taken up.

Of particular interest is the chapter on glandular cystic hyperplasia of the endometrium resulting from persistent graafian follicles (metropathia hemorrhagica). Here roentgen-ray castration as a therapeutic agent and its dosage are discussed, and reference is made to the difficulties of gauging a subcastration dose in young women where one may use radiation in preference to removal of the pelvic organs. Roentgen therapy has been found more effective when the exposure is given immediately after cessation of menstruation, because of the development of the follicle at that time. The illustrations in this chapter are particularly enlightening.

The author devotes a chapter to the practical usefulness of hormone preparations in the therapy of uterine hemorrhage, giving his results with anterior pituitary hormone, sex, or follicle, hormone, and the corpus luteum hormone. Here, again, he emphasizes the fact that our knowledge of endocrine therapy is still in a state of flux. He has obtained good results in the hemorrhages from hyperplasia of the endometrium with "Prähormon" giving 1000 rat units a day, either by suppositories or injections, and feels that they have ameliorated also several cases of "Puberty Bleeding" by this method. The sex, or follicle, hormone therapy is found of benefit in cases where muscular inability of the uterus exists or in infantile uteri associated with bleeding. He has exhibited 100 mouse units in the morning and 500 mouse units at night, the latter because the diminished excretion of urine at night results in a longer retention of the hormone in the body. He is not enthusiastic over the corpus luteum hormone, probably because of the unreliability of the available preparations.

The subject of Leucorrhea is taken up in considerable detail as to etiology, source and therapy. The presence of Monilia is regarded as a secondary manifestation. He is particularly favorable to the use of lactic acid in the treatment of certain types of vaginitis.

The rather full development of the therapy of bleeding and leucorrhea, as well as the fact that the physiology is quite up-to-date, makes this excellent monograph of unusual value.

—Philip F. Williams.

The evident need for a small concise manual on prenatal care has resulted in a second edition of this excellent little book.¹⁰ To complete its value as a maternity clinic manual a chapter on postnatal care has been included. The newer biologic tests of pregnancy and the British Maternity benefits are mentioned.

—Philip F. Williams.

⁹*Blutung und Fluor von Prof. Dr. Hans Runge, mit einem Vorwort von Prof. Dr. Robert Schröder. Theodor Steinkopff, Dresden und Leipzig, 1931.*

¹⁰*Ante-Natal Care* by Dr. W. F. T. Haultain and Dr. E. Chalmers Fahmy, with foreword by Professor R. W. Johnstone. Second Edition, William Wood and Company, New York; E & S Livingstone, Edinburgh, 1931.

Although statistical tables are usually tiresome there is a decided quickening of interest in obstetric results in a perusal of the current report, 1929, of the Glasgow Royal Maternity and Women's Hospital.¹¹ The method of classifying admissions is particularly enlightening on the influence of prenatal care upon maternal mortality; cases which received such supervision had a death rate of 0.9 per cent, emergency cases and cases which had not received any prenatal care at all had a collective mortality of 6.6 per cent. The maternal death rate for cesarean section was 4.7 per cent. There were 75 stillbirths among 210 breech presentations. It might be well for purpose of comparison of results if lying-in hospitals in America would adopt a standard scheme for their reports such as the one followed here, which was suggested by the Royal Society of Medicine for the unification of the clinical reports of maternity hospitals in Great Britain.

—Philip F. Williams.

This volume, *A Textbook of Surgery*,¹² edited by Dr. John Homans, represents the teaching of surgery in the Harvard Medical School. The material assembled from the lectures and other writings of a brilliant array of twenty-three surgical teachers has been edited to offer in a single volume the fundamentals of surgery, without stress on the technical side. It forms a splendid textbook of regional surgery for students and general practitioners. For the sake of completeness chapters on the ear, eye, nose and throat and on gynecology have been included. To many of the chapters a historical introduction which lends to the interest of the book has been included. In most sections a discussion of anatomy and physiology of the parts concerned brings added value to the presentation of the remaining material. The editing shows a most conservative attitude on the part of the compiler.

The section on gynecology is a clear and concise epitome of the present-day knowledge of that subject. Of necessity surgical treatment is but briefly discussed but the clinical manifestations have been fully gone into, the indications for operation or nonoperative measures presented in such a manner as to be most helpful to the general practitioner. With remarkable clarity and incisiveness an unusual amount of information on the female reproductive tract has been compressed in the twenty-six pages.

A bibliographic index of fifty pages follows the text. This lists by pages authors previously reviewed, the title of the article, and the journal reference, an aid to anyone wishing to do collateral reading or to search original literature.

The format is good, the book is printed on thin paper, and the illustrations, in many instances line drawings, simple in character, thoroughly correlate the text.

It is a splendid single volume textbook on surgery, well calculated to fit the needs of the student or the practitioner who wishes to review fundamental principles of surgery.

—Philip F. Williams.

The subject of *Abdomino-Pelvic Diagnosis in Women*¹³ is offered in a volume so large that one wonders at first glance if the text may not be redundant, and further examination proves this to be the case. While Dr. Walscheid has been extraordinarily complete in his consideration covering practically every known gynecologic condition, one finds in many instances considerable repetition of the

¹¹*Glasgow Royal Maternity and Women's Hospital, Medical Report for the Year 1929.* Prepared by J. N. Cruickshank, M.D., F.R.F.P.S. (Glas.), M.R.C.P. (Lond.). Aird and Coghill, Ltd., Glasgow, 1930.

¹²*A Textbook of Surgery.* By John Homans, M.D. Compiled from Lectures and Other Writings of Members of the Surgical Department of the Harvard Medical School. With a Special Bibliographic Index and with Illustrations by Willard C. Shepherd. Charles C. Thomas, Publisher, Springfield, Ill., Baltimore, Md., 1931.

¹³*Abdomino-Pelvic Diagnosis in Women.* By Arthur John Walscheid. St. Louis, 1931, The C. V. Mosby Company.

same idea. Dr. Walscheid devotes an unusual amount of space not only in the introductory chapters but elsewhere in the book to the relationship of body type to gynecologic disease; evidently his ideas are much influenced by Jayles' writings on anthropology.

In addition to presenting voluminously the lesions of the pelvis the author has included chapters devoted to diseases of those parts of other systems located in or near the pelvis, the abdominal wall and viscera, and of the anus and rectum. As a slight example of the disproportion in treating of various subjects it may be mentioned that elephantiasis vulvae occupies five pages with four illustrations, while ureteral lesions receive but a scant page. Although endometriosis is well worked up, the name of Sampson appears but incidentally, and while the Aschheim-Zondek test is mentioned as a general diagnostic procedure, the author fails to refer to its specific application later in chorioepithelioma. In spite of these minor criticisms the completeness of the subjects and the thoroughness with which they are covered renders the volume excellent for collateral reading.

—Philip F. Williams.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

A REVIEW OF THE GYNECOLOGIC LITERATURE OF 1930

BY SYDNEY S. SCHOCHET, M.D., AND JULIUS E. LACKNER, M.D.,
CHICAGO, ILL.

(From the Division of Obstetrics and Gynecology, Michael Reese Hospital)

(Continued from August issue)

MENSTRUAL DISORDERS

Views on the physiology of menstruation are constantly changing. According to Novak¹⁰⁰ there is evidence that forces us to question seriously the indispensability of ovulation to menstruation. We must abandon the theory that the life of the germ cell per se is the dominating influence in the cycle and that it determines the periodicity. Corner and Hartman¹⁰¹ have described numerous operations on the menstruating monkey in which there was no evidence of preceding ovulation, although there were normal menstrual cycles. Hartman¹⁰² found that the monkey menstruates but does not ovulate during the summer months. Apparently the ovum is not the underlying factor in menstruation. The follicle and the corpus luteum are important in the mechanism of menstruation but are not to be looked upon as the causes of menstruation. Hartman¹⁰³ feels that the causative factors of menstruation are outside of the ovary though cooperating with this organ in the maintenance of the menstrual rhythm. Novak¹⁰² says that the ovarian secretion has a dual rôle; that of the follicle, and that of the corpus luteum. In the human cycle, the follicle is responsible for the early, slow, hypertrophic changes in the endometrium up to the beginning of the secretory phase; and the premenstrual phase is associated with the development and maturation of the corpus luteum. Corner¹⁰² has established the existence of a specific corpus luteum hormone. The pituitary, by the probable periodicity of its own function, may be the regulator of the menstrual rhythm. Zondek and Aschheim¹⁰² designate it the motor of the ovary. The action of the pituitary is indirect through the ovary.

Evans and Simpson¹⁰² have been able to demonstrate two distinct hormones of the anterior pituitary, a growth substance, and a maturity provoking hormone. In summarizing the influences of the anterior lobe of the pituitary gland on the ovary, Cannon¹⁰⁴ says that the alpha hormone of the pituitary gland stimulates the ripening of the follicle which leads to ovulation. It also activates the estrus-

producing hormone responsible for the gradual development of the endometrium, characteristic of the interval phase. The beta hormone of the anterior pituitary gland stimulates the luteinic hormone of the corpus luteum. The estrus-producing hormone and the luteinic hormone combined, produce the series of changes which constitute the premenstrual cycle. Menstruation is undoubtedly the withdrawal of hormone support of the corpus luteum. The periodicity of the human menstrual cycle does not depend on the ovum but is due to the harmonious adjustment of many ductless glands. (From these brilliant research investigations and in spite of the epochal advances in recent years, it is evident that the final chapter in the perplexing problems of menstruation has not been written.)

In the consideration of menstrual abnormalities, we are impressed by the important rôle the hormones play as causative factors. Corner and Allen¹⁰⁵ have demonstrated that the corpus luteum produces a substance as important as the follicular hormone in the menstrual cycle. The pituitary hormones have no direct effect on the genital mucosa but exert their effect primarily on the ovaries. The follicle substance produces a direct estrus effect on the genital mucous membrane in both the castrated and noncastrated animals. All of the ductless glands are intimately concerned with reproduction. According to Riddle¹⁰⁵ this interrelationship makes the interpretation of menstrual disorders most difficult. Amenorrhea, in many instances, is a purely functional pituitary deficiency. Production of menstruation requires the hormones both of follicle and corpus luteum, as well as the hormones of the anterior pituitary gland. The cure of amenorrhea will be brought about by the hormones that activate the triangular mechanism of ovary, uterus, and hypophysis.

Novak suggests, on theoretical grounds, that the active principle of the corpus luteum isolated by Corner and Allen,¹⁰⁵ in combination with the follicle hormone, should mimic the normal menstruation. Anterior pituitary therapy has not fulfilled clinical expectations. Novak¹⁰⁵ thinks that thyroid extract remains the sheet anchor in the treatment of amenorrhea. The endocrine treatment of dysmenorrhea must be viewed pessimistically. Novak agrees with Frank¹⁰⁵ that irradiation of the ovaries in the treatment of amenorrhea should be used with great caution for fear of destroying totally the apparatus in an already deficient ovary.

Functional menorrhagias at or near the menopause are caused by the persistence of graafian follicles and the absence of corpora lutea. The anterior pituitary also plays an important rôle. Johnstone¹⁰⁶ says that in menorrhagia there may be an excess of follicle hormone. This may be due to an overproduction of the growth factor from the anterior pituitary lobe. Novak suggests that, since there is an absence of corpora lutea in functional bleeding, the administration of the newly active principle of corpus luteum may give the desired clinical results.

According to Graves,¹⁰⁷ periodic dysfunctional bleeding is due to an unbalanced physiologic state of follicle and corpus luteum hormones. The bleeding from fibroids (with the exception of the adenomyomas, the pedunculated and degenerated submucous myomas) is dysfunctional in character and is identical both morphologically and physio-

logically with that of the normal uterus. (This is a new conception of bleeding due to fibroids.)

Shaw¹⁰⁸ describes four clinical groups of uterine hemorrhage, viz.: metropathia hemorrhagica, due to uterine and ovarian dysfunction; epimenorrhoeal group, in which ovarian rhythm is too frequent; hypomenorrhoeal group, in which there is an irregular ovulation; and metrorrhagia, in which the ovaries are overactive due to marked defectiveness of the corpus luteum. The influence of the anterior pituitary body must also be considered. (While this new classification is interesting, more proof is required.)

Paroh¹⁰⁹ believes that the beneficial action of diathermy of the thyroid gland in the metrorrhagias of puberty, associated with deficient function, is due to a stimulation of the thyroid. Maurozio¹¹⁰ reports the treatment of metrorrhagias of puberty with intravenous injections of blood. Seventeen of the 21 cases were reported as cured. McDonald,¹¹¹ and Matlock¹¹² advise radium for functional bleeding before resorting to surgical procedures. Lawrence¹¹³ believes that menstrual disorders in adolescent girls are caused by insufficiency of anterior pituitary hormone.

Whitehouse¹¹⁴ has suggested that dysmenorrhea is due to difficulty in the disintegration of the superficial layers of the menstrual decidua. The transient exacerbations of pain are associated with the passing of abnormally large flakes of endometrium. The beta hormone of the corpus luteum produces the premenstrual changes. A disharmony in the mechanism might be responsible for the clinical phenomena of this action. (These views are at variance with the accepted teachings.)

Norman F. Miller¹¹⁵ feels that menstrual discomfort can be relieved, to a great extent, by posture and more fundamental muscle tone. Cases of dysmenorrhea associated with interstitial thyrotoxicosis are often relieved by therapeutic measures.¹¹⁶

Martin¹¹⁷ suggests the production of an artificial menopause with irradiation for the relief of menstrual headaches in women past forty. Keith¹¹⁸ suggests a similar treatment.

Brown and Brews¹¹⁹ report 50 cases of congenital retention of the menses; 41 patients had an obstructing membrane situated at the junction of the vulva and vagina, and the other 9 cases at different levels in the vagina.

Schlange,¹²⁰ in a study of gastric secretion, found that there were no appreciable changes during the menstrual period.

Jameson, Bristol, and Cavanaugh¹²¹ analyzed the records of 363 tuberculous women and found that there was a premenstrual rise in temperature in 42.4 per cent and that the extent of the tuberculous process exerts no definite effect on frequency or elevation of the temperature.

According to Geist¹²² there is a wide range of variability in the actual concept of the normal menstrual function.

Sakheim and Lehfelddt¹²³ report that in a large percentage of climacteric women there exists a lymphocytosis due to a thyrotoxicosis.

Meyers and King,¹²⁴ corroborating Hannan's¹²⁴ experiments, found that in certain women, at the menopause, there is a disturbance in the epinephrine reaction. This is suggestive of a hypersensitivity of the sympathetic nervous system at the menopause. Von Magyary¹²⁵ attributes the disturbance of the blood pressure during the menopause

to a loss of function of the ovaries. TeLinde¹²⁶ analyzing 179 cases of postmenopausal bleeding found that 60 per cent were due to malignancy.

UTERUS

In a review of a series of 683 cases of fibroids, Lynch¹²⁷ observes that the large fibroid develops and causes symptoms earlier. He finds that hemorrhage, rather than degeneration, is the chief symptom of most of the fibroids of the present day. Fibroids develop more often in women relatively sterile because of congenital causes. Polak¹²⁷ feels that fibroids have an endocrinal unbalance with maldevelopment. Malignant growth complicated 32 of Lynch's 683 cases. There is not a close relationship between fibroids and cardiomyocardial degeneration. Lynch favors the surgical treatment of fibroids because it permits conservatism.

The movements of fibroids in or adjacent to the uterine canal are due to uterine contractions, similar to the action of uterine contractions on the fetus.¹²⁸

In an interesting article on the secondary growth of submucous fibroids, Fink¹²⁹ shows that injury to the birth canal and close approximation of the tumor to the underlying tissue are the more important etiologic factors. Borochoewitsch¹³⁰ cites a case of expulsion of a large fibromyoma with an abortion. The submucous myoma was the cause of the uterine contractions which induced the expulsion of the ovum. Thurunen¹³¹ reports two cases of myoma of the portio vaginalis. There are 112 cases reported in the literature. An unusually large fibromyoma of the uterus weighing 133 pounds was removed by Behrend.¹³²

Cetroni¹³³ reports a case of red myoma of the uterus and says that when necrosis is total, symptoms are acute. When necrosis is central, symptoms are chronic. (This is a sarcomatous change in the myoma and not a degeneration.)

Scaglione¹³⁴ notes that fibroids rarely develop before puberty or after the menopause. There is an apparent relationship of fibroids to ovarian activity. Danforth¹³⁵ records a series of 233 cases and concludes that surgical procedures are more conservative than irradiation. The supravaginal hysterectomy is the operation of choice. Scheidt,¹³⁶ Davis, and Cuseck¹³⁷ also favor this type of treatment.

In reviewing the treatment in 30 cases of submucous fibroids, Fink¹³⁸ concludes that enucleation is contraindicated when there are other fibroids. In the climacteric patient deep enucleation of the submucous fibroid may cause perforation. Labhardt¹³⁹ says that 20 to 25 per cent of uterine myomas require no treatment. Irradiation is contraindicated in patients who have not reached the menopause and where malignant degeneration is present. He irradiated in 20 per cent and operated 80 per cent of 1,000 cases reported.

According to Wood¹⁴⁰ many uncomplicated fibromyomas are removed surgically which would better be treated with roentgen irradiation. The advantages of the x-ray are lack of surgical risks, simplicity of treatment, certainty of result, and low cost to the patient. In young patients, myomectomy is preferable as it permits future pregnancies. (Surgery appears to us to be the ideal method of treatment.)

Surgery is indicated in patients with concomitant ovarian disease

or inflammatory tubal complications. With a correct diagnosis and a choice of cases, Zweifel¹⁴¹ has the best results with radiation. In young women and very nervous women, radiation is contraindicated.

Carcinoma of the cervical stump occurs in about 1 per cent of the cases. Total abdominal hysterectomy is the operation of choice when the cervix is the seat of pathologic lesions. According to Counselor¹⁴² this operation is also indicated when the history suggests the possibility of malignant changes in a fibromyoma. Solomons¹⁴³ performs a total hysterectomy in these cases. Kennedy¹⁴⁴ approximates all the cervical ligaments following a total hysterectomy, thus constructing a substantial diaphragm above the vagina with a narrowing of the culdesac.

Vaginal hysterectomy should not be attempted when the body of the uterus is too large or when there are marked abdominal complications.¹⁴⁵

Samuel¹⁴⁶ recommends a vaginal corpus amputation for sterilization in active tuberculosis or in mitral lesions complicating the pregnancy. (We prefer tubal sterilization.)

Micholitsch¹⁴⁷ explores the uterine cavity abdominally to diagnose possible uterine perforations. Strassman¹⁴⁸ describes a very interesting case of obliteration of the uterine cavity with amenorrhea due to a former uterine rupture and vigorous curettements. He brought the right tube down through an artificial uterine cavity and anchored it at the internal os. The operation was followed by normal menstrual periods after an amenorrhea of three years. (Since tubal mucosa does not menstruate, we cannot understand the rationale of this operation.)

Uncontrollable hemorrhage occasionally follows vaginal and abdominal extirpation of the uterus. Logothetopoulos, according to Küstner,¹⁴⁹ packs the pelvis abdominally or vaginally in these cases, with a gauze bag in which eight to ten meters of gauze are placed to control the hemorrhage. The pack in each instance is removed vaginally.

Andrey¹⁵⁰ insists that serious joint involvement of women suffering from gonorrhea necessitates curettement of the uterus. (We object to this type of therapeusis.)

Stein and Torek¹⁵¹ report a case of adenocanthoma of the uterus. The metastases were in the lung and mediastinum. Another interesting case of papilloma of the endometrium is described by Dafoe.¹⁵² Only two other cases of this type have been reported in the literature.

Another rare case of true cavernous hemangiomas of the uterine wall without fibromyomas is cited by Horgan.¹⁵³ This is the fifth case recorded in literature. Lewinski¹⁵⁴ describes a case of lymphogranuloma involving the uterus and bladder.

Kimura¹⁵⁵ describes a case of cancer of the cervix complicated by multiple uterine fibroids, a cyst of the right ovary, bilateral parovarian cysts, and salpingitis. He reviews combinations of two, three, or four types of tumors of the uterus. Tommaselli¹⁵⁶ cites a case of abscess of the uterus containing 5 liters of pus, due to suppuration of a pedunculated fibroid. In 938 myomas and polyps, Glas¹⁵⁷ found 11 myolipomas and one lipoma.

Szathmary¹⁵⁸ reviewed 500 cases of chorionepithelioma; 47 per cent after hydatid mole; 26.6 per cent after abortions; 19.8 per cent after normal delivery; and 6.6 per cent after extrauterine pregnancy. Of the 500 cases 373 were operated. The mortality was 50 per cent. The

author advises prophylactic x-ray treatment in all cases of hydatid mole. (We suggest that the Zondek-Aschheim test be made every six or eight weeks to detect early malignant changes.)

Sturgis¹⁵⁹ believes that hydatid mole occurs more frequently than recorded. Delay in recognition and treatment increases the primary operative mortality. In his report on hydatid mole, Watkins¹⁶⁰ says that radical surgery is not justified until symptoms of malignancy develop. (Again we suggest the Zondek-Aschheim test as a check up in these cases.)

Schmitz¹⁶¹ advises microscopic examination of all tissues expelled during an abortion, full-term labor, or accompanying a mole, to exclude diseases or newgrowths of the chorion. (An excellent suggestion.)

Holman and Mathieu¹⁶² report a case of membranous cervicitis due to corynebacterium Hoffmanni, the first to be reported in the literature. Young¹⁶³ believes that chronic infection of the cervix is the most common gynecologic cause of pain in the lower abdomen and pelvis. He advocates cauterization of the cervix in these cases.

Bishop¹⁶⁴ cites a case of tuberculosis of the cervix. Primary tuberculous infection of the cervix is exceedingly infrequent; less than 25 cases have been reported. More often, tuberculosis of the cervix is secondary to other foci in the body.

Puente¹⁶⁵ reviews the cases of syphilis of the cervix over a period of ten years at the Rivadavia Hospital in Buenos Aires. He believes that syphilitic lesions of the cervix would be diagnosed more often if more thorough and frequent examinations were made.

Matters¹⁶⁶ treats gonorrheal endocervicitis with diathermy every third day, and injects a 3 per cent solution of mercurochrome into the subendocervical tissues at several points of the periphery. Baker and Miles¹⁶⁷ advocate cauterization of the cervix with a cautery that only chars a very superficial portion of the endocervix, thus avoiding carbonization of tissues with subsequent primary and secondary hemorrhages. Tovey¹⁶⁸ recommends copper ionization in the treatment of cervicitis. Copper ionization causes chemical infiltration, coagulation, and dehydration. Copper salts are carried deep into the tissues. There is no parallel between cauterization and ionization. (We have many unsatisfactory results with local treatments for endocervicitis.)

Fraenkel¹⁶⁹ advises the use of the Sturmdorf cervical excision in cases of endocervicitis and urges its more frequent use in Germany.

In cases of leucoplakia of the portio vaginalis, Haselhorst¹⁷⁰ advocates constant and repeated examination and biopsy.

Von Mikulicz-Radecki^{171, 172} has demonstrated a sarcoma of the uterus with a hysteroscope which proves the value of the latter in the diagnosis of intrauterine lesions. He says one can differentiate a polyp of the corpus uteri from a submucous myoma by this method. Sigwart¹⁷³ contradicts this statement. (We had the privilege of seeing Professor von Mikulicz-Radecki demonstrate the use of his hysteroscope at the Michael Reese Hospital. We frankly confess that we did not appreciate the great value of this excellent procedure previous to this clinical demonstration.)

Schultze,¹⁷⁴ in a study of the nonpregnant uterus with x-ray, says one can determine the muscle tone of the uterus by that method. Decreased tone at the time of the menses is indicated by the rounded

outline of the uterus. Increased tone is shown by a distinct outline of the cornua of the uterus. The uterus contracts throughout, or in local circumscribed areas.

Devlet-Kildeeva and Raikhstein¹⁷⁵ found that sterility, abortions, and premature labors were common among women working in the lead industries. In a series of experiments on the isolated uterus in nulliparous, multiparous, and pregnant cats, they found that lead caused a hypertonic condition of the uterus.

Bickenbach¹⁷⁶ reports a case of hemorrhagic necrosis of the uterus and adnexa due to intrauterine injection of powdered soap. The necrosis was caused by the sodium hydrate.

Among the reports of rarer conditions are: a case recorded by Shaw¹⁷⁷ of sacculation of the uterus due to a weakness in the uterine wall at the site of fusion of the müllerian ducts; and a case described by Blair Bell¹⁷⁸ of inversion of the uterus due to a necrotic fibromyomatous polyp.

MALPOSITIONS

Royston¹⁷⁹ reports 69 operations on 62 patients with complete perineal laceration. The best results were obtained in those cases in which fine and easily absorbable catgut with few knots was used. The desirable time for defecation is twelve to fifteen days after operation. No enemas or rectal tubes should be employed. In primary repairs, continuous, fine, plain catgut is sufficient. (Experience teaches us that secondary repairs require a heavier and more durable suture.)

Farrar¹⁸⁰ reports 12 cases of repair of high laceration of the rectum by the modified Warren-Apron technic, with a cure in ten cases.

Liepmann¹⁸¹ finds among 325 retroflexions that six cases in this series were congenital. He compares congenital retroflexion in the female to kryptorchismus in the male; both conditions are due to failure in development.

John Cooke Hirst¹⁸² reports 225 operations in which the round ligaments were overlapped in the midline as suspension operations for retroflexion. He recommends this type of operation with the correction of associated pelvic lacerations when the therapeutic test with a retroplacement uterine pessary has been unsuccessful. There were two primary failures. Successful pregnancies with no dystocias in labor were frequent.

Abell¹⁸³ describes a technic of ventrofixation of the uterus in the presence of complete procidentia in women past the menopause. He makes the uterus an integral part of the abdominal wall and fixes it to the fascia. The suturing and anchorage are extraperitoneal.

Julich¹⁸⁴ has obtained the most satisfactory results in correcting retroflexion of the uterus by Werth's modification of the Olshausen technic. Werth makes a vesicle ruff in suturing the plica vesico-uterine to the uterus between the attachments of the round ligament. Bladder symptoms do not develop during pregnancy since only the peritoneal covering of the bladder, and not the bladder per se, is anchored to the uterus.

Counseller and Stacey¹⁸⁵ report the results of prolapse operations. The check-up was made two years subsequent to the operation. Of the 819 cases, 106 occurred in women in the childbearing period; 713 patients were past the menopause. There were 16 deaths, a mor-

tality of 1.62 per cent. Satisfactory results occurred in 95.97 per cent. The modified Gilliam technic combined with a vaginal plastic was the operation of choice for ventral suspension. This operation gave 88.7 per cent of satisfactory results. The Kocher operation for prolapse of the cervical stump was satisfactory in 94.87 per cent. The Watkins-Wertheim interposition operation was used in cases of normal sized uterus with a mild degree of prolapse and a large cystocele in the menopause; 96.61 per cent were successful. The Mayo vaginal hysterectomy was performed in 81 per cent of the cases past the menopause with large cystoceles and marked degrees of prolapse. The results were satisfactory in 97.22 per cent. Crossen¹⁸⁶ feels that an abdominal operation is required in prolapse only when there are other complicating conditions necessitating celiotomy. Vaginal hysterectomy is indicated when the uterus is pathologic.

Hurd¹⁸⁷ writes that surgeons at the Women's Hospital place little or no credence on the worth of round ligament operations nor of any intraabdominal procedures such as the various types of corpus fixation in the treatment of prolapse. Most cases can be handled by one of three methods, (1) the interposition operation, (2) the Alexandroff operation, or (3) vaginal hysterectomy. The latter is the best of the three methods. Fullerton and Faulkner¹⁸⁸ feel that the excellent primary and late results with vaginal hysterectomy in elderly women with marked prolapse make it the preferable operation in selected cases.

Payne¹⁸⁹ describes a technic for the repair of prolapse of the vagina following hysterectomy, with a report of four cases. Abdominally, he dissects the bladder, rectum, and broad ligaments from the vagina. Then introduces three silk purse sutures, forming an infolding mass of the upper end of the vagina. This acts as a plug for the outlet. The broad ligaments are then attached to this stump and the vesical peritoneum anchored posteriorly. A perineorrhaphy is performed. (In reviewing the various operations for prolapse, one is struck by the divergence of opinions among excellent men in regard to the most appropriate and most satisfactory type of operation.)

Sellheim¹⁹⁰ describes a condition "Hiatus vagina" in which inflammation of the vaginal walls has occurred during the puerperium, with a consequent formation of scar tissues which causes the vagina to gape. This is often accompanied by garrulitis vaginæ. Hiatus vaginæ decreases the libido.

MALIGNANCY

In spite of the intensive study of newgrowths in well-equipped laboratories throughout the world by investigators thoroughly trained in all of the related branches of science, no epochal progress has been made in the solution of this problem. Cancer takes annually a larger and larger toll of our adult population in spite of improved operative technic and advanced knowledge concerning malignancy. Possible cures still depend mostly upon early recognition of the disease. This aim of early diagnosis will be best accomplished, as stated by Grenough,¹⁹¹ by the establishment of Cancer Clinics.

The etiology of malignancy remains a secret although we associate this type of abnormal cell multiplication with the type of cell multiplication (hyperplasia) occurring in various types of inflammatory

reactions. Bailey¹⁹² presents a very careful analysis and study of the basic cause and nature of cervical cancer, and concludes that the intermediate causal factor is due to the rôle of bacterial action and inflammatory exudates upon epithelia. These recurrent attacks of specific intensity from the epithelial standpoint, involving epithelium during the danger period, result in the production of cancer. Bailey's studies appear to support the theory of Yamagiwa of Tokio that cancer may result from prolonged stimulation of cellular growths.¹⁹³ Working with more refined materials than Yamagiwa, Twort¹⁹⁴ has prepared an active carcinogenic tar from pinene. Spirito¹⁹⁵ was unable to produce uterine cancer with weak or strong doses of tar. The trend of cancer research is in support of the old views that cancer is usually the result of protracted stimulation of the growth of tissue by nonspecific agents.¹⁹³

In an excellent exposition of the cancer problems, Kolischer¹⁹⁶ deplores the tenacious clinging to traditional concepts in the search for a single cause of malignancy. He believes that the aggregation of cells called a cancer is subject to the same biologic laws that govern the life of all other type of cells. Boerstrom¹⁹⁶ asserts that cancer is not the result of transformation of epithelial cells (highly differentiated cells never change their established characteristics) but is due to the transformation of the not specially differentiated cells of the reticulum around the capillaries. Mayo¹⁹⁷ asserts, that in the 10 per cent of people who have cancer, the cause or causes of cancer are due to varying degrees of immunity in the individuals.

The use of hormone extracts from the adrenal for the cure of cancer as reported by Drs. Coffey and Humber is not compatible with certain pathologic findings. Since cancer grows freely in the adrenal why hope to inhibit such growths by an extract¹⁹⁸ made by crude chemical processes which may alter more sensitive products? Cooke¹⁹⁹ has frequently observed the transition to malignancy in benign lesions of the uterine mucosa. (We admit our ignorance about these changes of benign lesions into malignancy for we have never found them in our studies.)

Among the recent cases of malignancy occurring in childhood and infancy are those of Morse²⁰⁰ and Kohlhas.²⁰¹ The patient of Kohlhas was only sixteen months old.

The conception that tumor proteins differ in essential respects from those of normal tissues has not been confirmed by chemical methods; however, there is a difference in the distribution of proteins in the tumors from that in normal tissues. There is a higher content in nueleoproteins, less uncoagulable protein, and less globulin and albumin. Vaughan in his classical experiments on the guinea pig used both the water-soluble residue of cancer cells which was extracted with alkalized alcohol, and vaccine of tumor-cell emulsion. Both methods cause a lymphocytosis and in sensitized animals anaphylactic deaths. Longo²⁰² reports a leucopenia when his neoplastic vaccine prepared from human material was injected into women with malignant genital tumors. (A critical study of these two divergent reports indicates that the test per se is of no diagnostic value, but that the reactions are dependent on the amount of lymphocytic ferments present in the tumor vaccine.)

Only 40 cases of primary carcinoma of Bartholin's gland are record-

ed in the literature. Schneider²⁰³ treated his cases by radical excision followed by deep x-ray therapy. Although there exist twelve different operative methods for the treatment of carcinoma of the vulva only 73 patients were reported free from recurrence for a period longer than five years. Stoeckel²⁰⁴ advocates the Rupprecht radical operation followed by irradiation.

Pfleiderer²⁰⁵ found that there was a decrease in cancer of the uterus in Germany during the years 1917 to 1924. He points out that Germany's food supply was greatly limited in the period during which the decrease in the incidence of cancer of the uterus was most pronounced, and therefore concludes that nutrition is of some significance in the pathogenesis of carcinoma. (Cancer of the body of the uterus is a disease especially of the well-to-do as compared to a marked preponderance of cervical cancers in the dispensary group.) Graves²⁰⁶ is of the opinion that corpus cancer occurs more frequently than was observed in previous years.

In Welch's statistics on more than 3,000 malignant neoplasms cancer of the uterus presented 29.5 per cent of the total number of cases; the next in importance were malignant conditions of the stomach. Ginmaraes²⁰⁷ in a lecture points out that stomach cancer now holds the first place. This change may be due to the increase of operative procedures for leucoplakia of the portio and vaginal mucosa.²⁰⁸ (These divergent opinions are quoted to emphasize the chaotic condition that exists in the statistical medical literature.)

The increasing death rate from uterine carcinoma is due chiefly to a late diagnosis, and no small part of this responsibility can be attributed to the carelessness of the busy practitioner. Novak,²⁰⁹ and Spirito²¹⁰ again emphasize the importance of biopsy for the early recognition of cervical cancer and strongly advocate that the pathologic examination be made by one skilled in the interpretation of pathologic pictures found in the cervix. (We are in accord with Dr. Novak that the pathologic diagnosis must not be entrusted to the general pathologist who is not always familiar with pseudomalignant conditions so frequently found in inflammatory lesions of the cervix.)

Katz²¹¹ of Vienna reports that carcinoma of the cervix occurred in only 25 of the 82,825 obstetric cases delivered in his clinic. In cases where there is a coexisting malignancy and pregnancy, Kaplan²¹¹ advocates the termination of the pregnancy followed by irradiation treatment. The author is of the opinion that abnormalities in children born of irradiated mothers may be due to other sources than the radiation therapy. These views are not borne out by the research studies of Murphy²¹ and his coworkers. In the above type of cases, Tropea²¹² prefers electrocoagulation before the use of radiation therapy. This author believes that before surgical procedures are undertaken the status of life of the fetus, and the operability of the carcinoma should be considered. (We take no issue with individuals who base their conclusions and convictions on their religious views.)

Since the publication of Polak's 256 cases of cervical stump carcinoma collected from the American literature, numerous papers have appeared on the best methods of prevention of the development of cancer in the cervical stump. Branscomb²¹³ records 16 cases of cervical stump carcinoma, and notes that the estimated frequency of this condition after hysterectomy is from 0.4 per cent to 0.8 per cent.

When these cases occur, radium therapy or the use of external roentgen rays from a distance (bombardment) is indicated.²¹⁴

Since Orthmann's first description of primary carcinoma of the fallopian tube (1886), about 232 cases have been reported in the literature. Watkins and Wilson²¹⁵ find no characteristic physical signs or symptoms to aid us in making the diagnosis. In a large percentage of the cases (the diagnosis has been made only once before operation—Falk), the lesions were neither recognized nor suspected at the time of the operation. The prognosis is always grave and very few patients survive the fifth postoperative year. Anspach²¹⁶ believes that recovery of patients with primary cancer of the tube is less than 4 per cent with operation and x-ray. Holland²¹⁷ states that primary carcinomas of the tube are on the increase and records eight additional cases.

The old-time dictum of Virchow that an organ which is prone to primary cancer is rarely the seat of metastatic cancer is not borne out in actual experience. With this thought in mind, Tate²¹⁸ emphasizes the necessity of pelvic examinations of all patients with malignancy in remote organs. Robinson²¹⁹ does not concur with Conheim's theory of embryonal rests, but believes that primary ovarian cancers arise from epithelial elements of the fully formed sex gland. There is considerable support for this belief as Rokitsansky found that certain carcinomas develop from lutein cells.

Sarcomas of the ovary are rare in children under the age of ten years. Jaisohn²²⁰ found only 24 cases reported in the literature between the years 1888 and 1915. Sarcomas of the uterus in adults are not uncommon and according to Kelley, constitute 2 per cent of all uterine tumors or about 5 per cent of all malignant neoplasms. Phaneuf²²¹ found hemorrhage, pain, and serous discharge the three leading symptoms present in sarcomas of the cervix. Bérclère²²² advocates x-ray therapy for uterine sarcomas, not because of the cures, but on account of the absence of primary mortality and the longer period of amelioration of symptoms than obtained with surgical treatment.

Since Marchand's classical paper on hydatidiform mole and chorionepithelioma we have associated characteristic ovarian changes with these lesions. These generalizations no longer hold good in all cases of hydatidiform mole or chorionepitheliomas. In their critical study of chorionepitheliomas, Novak and Koff²²³ have found that the anterior pituitary is the immediate cause of lutein hyperreaction observed in the ovaries of these cases. In one of their cases the pituitary presented a marked and persistent pregnancy reaction due to the presence of masses of trophoblastic tissues in the metastasis.

According to Mack and Catherwood²²⁴ credit for observing the first positive reaction from urine of metastatic chorionepithelioma belongs to Robert Meyer and his assistant, Roessler.²²⁵ Novak says that the Aschheim-Zondek²²⁶ test bids fair to become a valuable adjunct to the diagnosis of early pregnancy. It has been found that the concentration of the anterior pituitary hormone in urine was several times greater in chorionepitheliomas than in normal pregnancies. Schultze-Rhönhof,²²⁷ Ehrhardt,²²⁸ Fahlbusch,²²⁹ and Hanz and Gault²³⁰ have found the Aschheim-Zondek test extremely sensitive and of real diagnostic value in these cases. If a previously positive Aschheim-Zondek

test in cases of chorionepitheliomas becomes negative, the prognosis is good, but if the test remains positive one must look for metastases.

A cross-section study of the methods of treatment of carcinoma of the cervix and uterus convinces one that there is no uniformity of opinion as to which method yields the best results. It is most difficult and almost impossible to ascertain the true final end-results from the mass of published statistics, all of which are more or less modified and influenced by varying local conditions. The methods of radiation therapy as employed by the various institutes and clinics are so completely at variance with one another that a fundamental comparison of the results obtained is impossible. This statement is concurred in by the radiologic division of the Cancer Commission of the League of Nations.²³¹

Zweifel^{231, 232} sums up the methods of the treatment for cancer of the cervix, namely: first, surgery, either vaginally or by celiotomy; second, irradiation; and third, surgery plus irradiation. Deaver²³³ states that the present methods in the treatment of cancer are inadequate and that the solution lies in the chemical field. Begouin²³⁴ analyzes his postoperative results (radical operation) of fifteen and twenty years and finds that the five-year period is a safe and sane criterion. Bounney²³⁵ discusses the value of the Wertheim operation in carcinoma of the cervix. The results of 284 cases showed an operative mortality of 16.5 per cent; 107 patients had recurrences before the end of five years; and 110 were well at the end of five years. Bounney²³⁵ emphasizes the fact that survival for five years after the operation cannot be considered an absolute proof of cure, since about 10 per cent of recurrences develop between the fifth and tenth year.

Heymen²³⁶ of Stockholm in a study of 790 cervical cancers of which 25.5 per cent were operable gives a cure of 20.6 per cent with irradiation. In a second group of 5,806 cases of which 54.6 per cent were operable 19.1 per cent were cured by surgery. From these studies the author concludes that in cases of cancer of the cervix radiologic treatment is the method of choice. Healy and Cutler²³⁷ evaluate radium treatment based on the histologic structure of the tumor cells. Intrauterine radiation was found to be the method of choice in the treatment of papillary adenoma malignum. The authors believe that cases of corpus carcinoma should be separated upon the basis of histologic structure and treatment instituted on the basis of pathologic and clinical types. D'Erebia²³⁸ advocates ligation of the internal iliac arteries as an improvement in the Wertheim operation. Kahlman²³⁹ noted an increase of neutrophils and a decrease in lymphoid cells in cases treated with x-ray. Most observers have found that irradiation increases the virulence of the vaginal flora. Bounano²⁴⁰ studied 20 cases and found that radium therapy never causes local or general septic complications. Doney²⁴¹ cites an interesting case of acute appendicitis complicated by old inflammatory adhesions from a previous radiation. In cases of cancer of the vulva, Buben²⁴² favors radium as the method of choice.

There is a marked difference of opinion as to methods of irradiation. Miescher²⁴³ employs moderate doses over a long period of time. Bowing²⁴⁴ accepts radiation as the method of choice in cervical carcinomas. The author and his associates report 981 cases and emphasize the known absence of a primary mortality with this method.

Meigs and Parker²⁴⁵ studied the action of radium therapy on the malignant cells by repeated biopsies. They found that there were two groups; in one there was an increase in mitotic figures on the third and fourth day, and in the other group there were no mitoses. In the first group all patients died at the end of thirteen months. Neil,²⁴⁶ Pitts and Waterman,²⁴⁷ Nebsky,²⁴⁸ and Bowing and Fricke²⁴⁹ conclude from their statistical studies that radiation is the method of choice for cancer of the cervix. (From this review of the methods of treatment we feel that they all are inadequate and that new methods of approach will arise from such careful studies. If we are true prophets, chemotherapy will replace the procedures of the present day.)

ENDOMETRIOSIS

Sampson²⁵⁰ presents a comprehensive study of tubal stumps. He found misplaced müllerian mucosa in 112 of the 143 stumps examined. In 100 uteri with intact tubes, misplaced müllerian mucosa was present in 16 instances. In 50 uteri with intact tubes removed for sequelae of salpingitis (a well-recognized cause of endosalpingiosis) misplaced müllerian mucosa was discovered in 19 of the 100 uterine ends of tubes. Sampson concludes that endosalpingiosis usually arises from sprouts growing out from the traumatized mucosa of the tubal stump of postsalpingectomies. Rubin²⁵¹ has failed to observe any cases of endometriosis as a result of tubal insufflation. Uterotubal insufflation is not likely to produce endometrial displacements if the method is performed properly and if the mucosa is intact.

In studies of autotransplants of endometrium in the peritoneal cavity of rabbits, Molinengo²⁵² found that attachments of pieces of muscle did not prevent growth, nor hormonal action of the ovary have any appreciable influence on the fragments of endometrium. Coggi²⁵³ reports cases of endometriomas in scars of celiotomies. Haselhorst and Otto²⁵⁴ record 27 cases of postoperative endometriosis of the scar of the abdominal wall, but are not positive that the implantation theory holds true in isolated cases. Kane and Kimbrough²⁵⁵ studied 118 cases of endometriosis and concluded that ablation of the ovarian function causes cessation of activity and progressive atrophy of the endometriomas.

ABORTION

In a discussion of therapeutic abortion, Sellheim²⁵⁶ outlines the difficulties in determining the indications of the borderline cases. Even though the consultant may favor emptying the uterus, the mother should be given a choice at this time.

The nervous and psychic disturbances of pregnant women with suicidal tendencies are most serious problems. It is usually advisable to combine sterilization with therapeutic abortion in this group of cases. Naujoks²⁵⁷ gives a detailed outline of the indications for therapeutic abortion.

Because of the possibility of the subsequent birth of a monster, it is questionable whether a threatened abortion should receive conservative treatment.²⁵⁸

Grann-Peterson²⁵⁹ reports 1,146 cases of abortion with a mortality of 0.61 per cent. The morbidity and mortality were lower with earlier emptying of the uterus.

Louros and Schieyer²⁶⁰ have shown in animal experiments that it is possible with intrauterine injections of charcoal to exert a favorable influence on the outcome of a streptococcal infection in one-third of the cases, by a heightening of the phagocytic activity of the reticulo-endothelial system toward introduced bacteria. The charcoal acts as an adsorbent and as a vehicle for the bacteria. Nahmmacher^{260, 261} recommends the intrauterine treatment of afebrile and febrile cases of abortion with charcoal as long as the infectious process is localized in the uterus. There is no danger connected with this treatment, its action is rapid, and it can be easily applied. Charcoal is especially indicated in febrile abortions. Beuthner,²⁶² in a series of experiments, found that the charcoal does not prevent bacterial invasion of the uterus but that the good clinical results were due to adsorptive properties of the charcoal.

Saunders, Lackner, and Schoelch,²⁶³ in a series of biologic experiments on the adsorption of drugs in physiologic salt solution, have found that activated charcoal will completely remove adrenalin, acetyl-choline, histamine, and other basic alkaloids. These authors reported clinical results with activated carbons.

EXTRAUTERINE PREGNANCY

In a study of 474 cases of ectopic pregnancy operated at the Mt. Sinai Hospital of New York, from 1912 to 1930, Urdan²⁶⁴ points out the following interesting facts: Previous sterility plays no important rôle, while previous pelvic infections are of extreme significance from an etiologic standpoint. There is often a history of amenorrhea for five or six weeks followed by bleeding and pain. The amount of bleeding is less than in threatened abortion. He believes that healed abscess cavities and diverticuli are important causes of extrauterine pregnancy.

The associated lesions of ectopic corpus luteum and ruptured tubal pregnancy are described in a case report by Lash.²⁶⁵ He says that only 20 cases have been reported in the literature.

In an analysis of 167 consecutive operations for extrauterine pregnancy, Behney²⁶⁶ finds that the preoperative diagnosis was correct in 61.3 per cent of the cases. Syncope occurred in 24 per cent. In the discussion of this paper, Titus²⁶⁶ points out the value of the sedimentation test in the differential diagnosis between unruptured or recently ruptured ectopic pregnancy, and an acute inflammatory process. Farrar²⁶⁶ emphasizes the value of the daily leucocyte count in combination with the sedimentation test in the diagnosis of extrauterine pregnancy.

Tallaferro and Lastra²⁶⁷ report a case of intraligamentous extrauterine pregnancy with an intraligamentous ovarian cyst. When an abdominal pregnancy has advanced to term, the hemostasis is more important than the removal of the placenta.

According to the experiences of Jeanneney and Rosset-Bressand²⁶⁸ rupture of an extrauterine pregnancy is not always accompanied by acute pain and the classical symptoms. Noe²⁶⁹ reports a case of ruptured extrauterine pregnancy without abdominal pain. There were no signs of hemoperitoneum and the uterus was of normal size with slight thickening of the left adnexa. (From our experiences we are

convinced that the classical textbook symptoms of ectopic pregnancy are many times absent.)

STERILITY

Of 438 women examined before the twelfth week of pregnancy, 14 per cent had a retroplacental uterus. Plass²⁷⁰ believes this frequency of retrodisplacement in pregnancy is an argument against the idea that it is a common cause of sterility. Hunner and Wharton, Danforth and Galloway,²⁷⁰ are of the same opinion. It is a known fact that in 40 per cent of women the uterus normally is in the retroverted position.

Rowe²⁷¹ studied the rôle of endocrine organs in the etiology of sterility and found that arranged in order of importance they are: ovaries, thyroid, and finally pituitary gland. Cases of sterility associated with amenorrhea are frequently due to a persistent corpus luteum. In these cases there appears to be an excessive or an uninterrupted secretion from the anterior lobe of the hypophysis (Rho II). Although sterility is frequently present in women with normal genitalia and menstrual function, yet there may be an unbalance in the secretion of the ductless glands. Too little pituitary and consequently too little corpus luteum hormone may make preparatory changes in the uterus inadequate for a fertilized ovum to properly imbed itself securely in the uterus.

With the exception of the cases of sterility due to the absence of mature gametes, sterility and early abortion may be assumed to result from the same disorders. Both may be due to inherent defects in the gametes per se, to incompatibility, or to an unfavorable environment surrounding the fertilized ovum.²⁷² It should be borne in mind that implantation of the ovum is associated with slight hemorrhage. When this bleeding is excessive it often causes absorption or abortion of the egg.

Amersbach²⁷³ is of the opinion that frigidity plays an important rôle in the etiology of sterility.

Kurzok and Miller²⁷⁴ believe that the head of the spermatozoon carries a lysin that dissolves the cervical mucus, thus enabling the sperms to enter the uterus. Moench²⁷⁴ claims that vaginal acidity is of little importance as a causative factor in sterility. He has determined repeatedly that spermatozoa live for hours in 0.5 per cent lactic acid solution. Weil²⁷⁴ has shown that beneficial effects on the spermatozoa are exerted only within narrow limits of alkalinity, and that a change of the hydrogen-ion concentration in either direction acts detrimentally. Therefore alkaline douches are of little value in the treatment of sterility. When the Hühner compatibility test is performed, the specimen is collected one hour after the intercourse. At that time, impregnators of the ovum will be beyond the cervix. Peham²⁷⁴ denies sperm immunity from a serologic standpoint. Moench has not found a spermotoxic reaction of serum in sterile women.²⁷⁴

In a discussion of ovarian deficiency and sterility, Macomber²⁷⁵ says that ovarian deficiency means a failure of reproduction due to failure of ovulation. The latter can be caused by anything which seriously impairs ovarian circulation. Of the acquired lesions causing sterility, infections of the fallopian tubes are the more important. Bell²⁷⁶ feels that a better understanding of the physiologic derangements of metabolism and of dietetic factors in their relation to sterility will lead

to an improvement in the treatment. Frigyesi²⁷⁷ has not been satisfied with the results from salpingostomy. He prefers the transplantation of the patent portions of the tubes into the uterine cavity. Sellheim²⁷⁸ has, in numerous instances, had a successful therapeutic effect with tubal insufflation. Salpingostomy is the only course left when the tubes are closed. However, Sellheim's successful results with this operation are less than the 10 per cent reported in the literature. He does not favor radiation of the ovaries in treatment of sterility, for he believes that more harm than good can come from this procedure.

The present treatment of established genital hypoplasia is ineffectual. Meaker²⁷⁹ reports gratifying results in early cases of hypoplasia when all depressive factors were eliminated. In a study of this important problem, Moench²⁸⁰ emphasizes the importance of a careful examination of the sexual habits in the investigation of any case of impaired or absent fertility.

Moench²⁸¹ outlines a detailed description of his technic of staining and of examining the spermatozoa in a specimen of semen. Sperm abnormalities are more easily diagnosed in the stained than in the fresh specimen. He believes that absence of all motility in repeated, absolutely fresh and uncontaminated semen establishes the cause of a sterility.

Hill and Smith²⁸² analyzed 198 cases and found that obesity in women per se is not a cause of sterility. When the two conditions occur in an individual the sterility is usually due to hypothyroidism. Anspach²⁸³ employs vitamin A diet and calcium lactate in the treatment of sterility. Reduction of the weight of the patient is also important. Obesity is frequently associated with impairment of ovarian function and ovulation. He reports no pregnancies after salpingostomy in his series, and concludes: "Until we understand the interrelationship and function of the ductless glands and have more accurate methods of estimating the excessive or deficient activity of each, we can scarcely hope for more favorable results. (We agree with him.)"

TUBES

To determine the effect of a 40 per cent lipiodol injection on structures of the uterus, tubes, and peritoneum, Schroeder and Jacobi²⁸⁴ examined 30 tubes, 26 endometrial scrapings, and 12 specimens of peritoneum. They conclude that lipiodol does not produce any histologic changes in these tissues. However, damages to the tissues have been reported. Lash²⁸⁵ interprets his case, and the cases of Odenthal and Ries, as foreign body reactions to lipiodol. Villar²⁸⁶ reports a tubal rupture following lipiodol injections. (The adverse reports may be due to faulty technic or failure to select the proper type of case. Lipiodol injections are safe in the absence of infections.)

According to Buckley and Mathien²⁸⁷ little or no bactericidal power can be ascribed to lipiodol or iodipin. Witwer, Cushman, and Leucutia²⁸⁸ report 512 cases of hysterosalpingography with iodized oil with only a single accident. They feel that iodized oil is of therapeutic value in some cases. Novak²⁸⁹ reports a case of foreign body peritonitis, due to the oil and concludes that tubal insufflation, under proper precaution, is less dangerous than salpingography. Curtis²⁹⁰

is of the opinion that the instillation of iodized oil is a valuable diagnostic measure but must be used with great caution. He has seen cases in which the peritoneal reactions were very severe. Watkins and Menne²⁹¹ studied the occlusions in the lumen of 49 tubes and noted that they were most common in the isthmie portion. Operations to reestablish the lumen should not be attempted until a definite diagnosis including site of the obstruction is made. Satisfactory surgical results are seldom obtained when the occlusion is in the intramural or isthmie portion of the tube. Lipiodol injections are contraindicated in pelvic infections. Von Mikulicz-Radecki²⁹² concludes that implantation of the tube in the uterus is alone successful when a portion of the pars isthmica is intact.

Rubin²⁹³ accepts the diagnosis of tubal obstruction when three successive insufflation tests at 200 mm. are negative. Strictures are most often found at the uterine ostia, the intramural and the distal part of the isthmus of the tubes. Whenever it is possible to correct a retroflexion, the repeated insufflations will determine a true obstruction or merely a tubal kink. Rubin states that strictures in the tubes can be localized with the kymograph. Permeable strictures cannot be determined by means of lipiodol unless a constant fluoroscopic examination is made and supported by repeated x-ray plates at stated intervals.

Denton and Dalldorf²⁹⁴ report a foreign body type of inflammatory process in the tube, which simulates tuberculosis and has been frequently confused with it. Definite tuberculous granulation tissue was absent in this case and there was no clinical evidence of tuberculosis in other organs. The diagnosis of tuberculosis should always be confirmed by animal inoculations or the demonstration of the acid-fast bacilli in the sections. (This valuable paper is of special interest to the gynecologists in view of the numerous case reports of tuberculous salpingitis.) Holtz²⁹⁵ reviewed 1262 cases of nontuberculous salpingo-ovaritis; 402 were gonorrheal; 102 septic; 10 representing a mixed infection of gonorrheal and septic; and 748 of unknown etiology. In 1.4 per cent of 290 cases in which the adnexa were removed, the condition appeared to be secondary to appendicitis. In 15.5 per cent it followed abortions or parturition. There is a frequent occurrence of violin string adhesions between the anterior surface of the liver and the anterior abdominal wall in gonorrheal disease of the tubes, according to the observations of Curtis.²⁹⁶

Mathieu²⁹⁷ advises the Bell-Beuttner operation in cases of chronic gonorrhea of the tubes.

Aldridge,²⁹⁸ in a review of 1066 cases of salpingitis says that the leucocytic count, temperature, and sedimentation tests should be normal before an operation for infection of the tubes is performed. (We do not believe that this teaching should be an inflexible rule.)

If reinfections can be avoided, Curtis²⁹⁸ finds that only 15 per cent of gonorrheal infections will ultimately require surgical intervention. Priestley and Payne²⁹⁹ studied the records of 98 patients with acute pelvic inflammatory disease, and found that 66 were cured; 10 required evacuation and drainage of tuboovarian or pelvic abscess; and 22 were operated during the subacute or chronic stages. The high operative incidence, 25 per cent, is explained by the fact that the majority of these cases were in poor financial circumstances and had

suffered from repeated exacerbations of the infection. Conservatism should be the rule. The ovary should be removed in its entirety or be allowed to remain undisturbed. Priestley and Payne are in favor of the maintenance of the menstrual cycle. Postoperative enlargement of the ovary occurred in 14 cases. Of the 14 cases, 3 complained of abnormal menstruation; 2 of severe pain due to the affected ovary which required subsequent operative removal.

Von Buben^{300, 301} treated 142 cases of adnexal inflammation with diathermy; 49 were cured; 81 improved; and 12 showed no change. He feels that diathermy relieves pain and decreases the size of the inflammatory tumor. Royston, Ewerhardt, Roblee, and Zener³⁰² report increased mobility of the uterus in pelvic infection after four or more treatments with the Zener cervicovaginal electrode. (We have failed to see the brilliant results reported by others with diathermy.)

Little³⁰³ reports his experience with turpentine injections in 75 cases of acutely inflamed tubes. After opening the abdomen he aspirated the tubes by means of a large syringe and injected a variable quantity of 10 per cent turpentine and oil (up to 70 c.c.). There was no attempt made to prevent the solution from exuding into the pelvic cavity. At the same time, an appendectomy, with ventral suspension by the Webster-Baldy, or Ohlshausen technic, was performed. One patient died; the body of the uterus and a large ovarian abscess had been removed; 90 per cent of the cases were permanently relieved of pain. In the vast majority of cases inflammatory masses disappeared within four to six months. (We question this procedure.)

Primary carcinoma of the fallopian tube was found in 0.02 per cent of all gynecologic admissions at Johns Hopkins Hospital, in 0.07 per cent of all gynecologic admissions at Lennox Hill Hospital, and in 0.31 per cent of all gynecologic laparotomies at the Leipzig clinic. About 200 authentic cases are reported in the literature. According to Watkins and Wilson³⁰⁴ the preoperative diagnosis has been made only in one case. Retroperitoneal lymph gland metastases are common. The prognosis of primary carcinoma of the tube is almost hopeless.

Ahlstrom³⁰⁵ reports actinomycosis of the left tube and ovary and cites 61 other cases in the literature. Infection is usually carried to the genitalia from the intestinal tract. The prognosis is bad.

Jameson³⁰⁶ finds that tuberculous pelvic disease occurs in about 8 per cent of women with pulmonary tuberculosis. The roentgen rays seem to offer a feasible conservative method of treating tuberculous lesions of the uterus and adnexa. (Pneumoperitoneum with oxygen is an excellent method of treatment.)

Curtis³⁰⁷ found 17 instances of tuberculosis in 200 tubes examined. Calcareous deposits, pallor of the lesions, peculiar rigidity of the adhesions and the open fimbriae of the tubes (in about 50 per cent) are the striking characteristics of tuberculosis of the female pelvis. Von Jaschke³⁰⁸ advises conservative therapy, artificial heliotherapy, and protein stimulation in the treatment of pelvic tuberculosis. Roentgen irradiation up to 15 per cent of the skin unit doses is also of some value.

Frank³⁰⁹ reports a rare case of subperitoneal cavernous hemangioma of the pelvic connective tissue which is the first recorded in the literature. This growth was partially removed at a previous operation.

The patient has had two subsequent operations followed by irradiation treatment. Bride³¹⁰ cites a case of hydatid cysts of the broad ligament. Einaudi³¹¹ reports two cases of tumors of the round ligament, one a fibromyoma, the other a dermoid cyst. A fibroma of the labium majus arising from the extrainguinal portion of the round ligament is described by Barbanti-Silva.³¹²

Five cases of torsion of normal tubes are recorded by Michon.³¹³ Torsion is usually unilateral.

Martinolli³¹⁴ noted that when the hypophysis was inactivated the motility of the tubes became markedly increased.

Hannes³¹⁵ gives the following conditions and indications for sterilization: cases in which another pregnancy is absolutely contraindicated; cases where sterilization accompanies a therapeutic abortion; and vaginal plastic operations like the Wertheim operation for prolapse. Haskin's³¹⁶ technic for sterilization consists in ligating the tube $1\frac{1}{2}$ cm. from the uterus with excision of the tube between the uterine horn and the point of ligation. The ligated end of the tube is sewed into the abdominal wall. (It appears that this procedure could lead to intestinal obstruction.)

In a study of postoperative changes in the libido, Vruwink and Popenoe³¹⁷ found that bilateral salpingectomy had no effect on the patients' sexual phase. The psychologic effect of sterilization appeared to benefit sexually one-third of the sterilized patients who previously feared pregnancy.

OVARY

There is a type of severe uterine hemorrhage in which no pelvic cause can be discovered, and in which presumably there exists a constitutional factor due to disordered calcium metabolism.³¹⁸ In diseases of the thyroid there occurs a disturbance of the uterine rhythm which Scibelli³¹⁹ ascribes to the thyroid and folliculin regulators. When vitamin E was absent in the diet of his experimental animals, Rio³²⁰ found an atrophy of the endometrium. Falconis and Chiapponi³²¹ observed that injection of spermatozoa caused a momentary inhibition of the external secretory functions of the ovary. Carloni³²² injected "folliculin" extracts and noted phenomena of hypotension and vasodilatation in the capillaries of the skin. According to Cordua³²³ the injection of one c.c. of serum of pregnant women caused growth of the uterus. Esch³²⁴ injected 10 c.c. of blood of pregnant women intraglutely at stated intervals in cases of amenorrhea with hypoplastic genitals and obtained striking clinical results. Zamkoff³²⁵ injected urine of pregnant women for amenorrhea without seeing toxic effects.

Caudela³²⁶ reports the results of a series of experiments with follicular, luteinic and mammary extracts, and notes that follicular extracts accentuate the development of the genital tract, the maturation of the follicles, and intensify the estrous cycle. The injection of mammary and luteinic extracts causes alterations in the menstrual cycle. Momoglioano³²⁷ believes that the secretion of the corpus luteum is a colloid rather than a lipid. Mahnert³²⁸ is of the opinion that the corpus luteum hormone influences the growth of the follicle indirectly and acts antagonistically to the hypophysis. In studies of the reaction of the uterine musculature during the menstrual cycle, Siegmund³²⁹

found a difference in sensitiveness to pituitrin in the musculature of uteri of the rat and rabbit. This may account for the apparent conflicting reports of the action of similar hormones in different mammals.

Conclusions from the studies of Fels³³⁰ appear to indicate that the placenta not only acts as a storehouse but also produces the anterior pituitary and the female sex hormone. Morrell, Powers and Varley³³¹ report that the follicular hormone is present in large amounts in the amniotic and allantoic fluids of cattle. Frank and Goldberger³³² found a lower renal threshold for the female sex hormone in cases of amenorrhea and functional sterility. Campbell and Collip³³³ reported that the oral administration of the ovary-stimulating hormone of the placenta gave clinical results in five cases of oligomenorrhea, two with menopausal symptoms, and in two cases of dysmenorrhea. Gabriellianz³³⁴ gives an excellent review of the endocrines in gynecology with a tabulation of 56 cases. There was an improvement in 44; partial improvement in 4; and failure in 7 cases.

Dahlberg³³⁵ is of the opinion that the mechanism of uni-ovulation is controlled by an inhibiting hormone, ovin, which is secreted in the follicular fluid, and in the corpus luteum of menstruation and pregnancy. Gilardino³³⁶ noted a distinct hyperemia and hypertrophy of the thyroid following the subcutaneous injection of follicular extracts. Bisceglie³³⁷ found that the hypophysis showed hyperemia, a constant increase in acidophiles, and a disappearance of the basophilic cells with the injection of follicular liquid. In the thyroid he found a gradual reduction of the volume of the thyroid cells, and a smaller amount of colloid material. Manzi³³⁸ states that large doses of folliculin produce a hypersecretion of the granulosa cells. (In the light of our present knowledge of the female sex hormone it cannot be surprising that many and varied conclusions about this substance are expressed in current publications.)

In a discussion of the ovarian hormones it becomes necessary to include references to the pituitary. In addition to their effect on the mammary glands, the kidneys (vasodilatation), and on growth, hypophyseal hormones produce three distinct effects: ovulation, luteinization of the follicle, and activation of the ovarian hormone (corpus luteum). The hormone of the corpus luteum causes characteristic changes of the premenstrual phase and decidual transformation in cases of gestation. For these reasons, Fluhmann³³⁹ points out, it becomes necessary to consider pelvic diseases from a "functional" standpoint. In a study of 319 patients, he finds that the pituitary hormone is increased during pregnancy, in the early stages of the menopause with irregular profuse periods, in a small number of young women with too frequent menses (menorrhagia), and in cases of severe dysmenorrhea. The test in this group showed an "ovulation" reaction.

Zondek^{340, 341, 342, 343} states that the anterior lobe of the pituitary produces two substances, the follicle-ripening hormone which he designated as Prolan A and the lutein-ripening hormone Prolan B. Each of these substances mobilizes an hormone in the ovary, the one, formed in the follicle, is termed Follikulin and causes growth of the uterine mucosa up to the beginning of the pregravid phase. The other, produced in the corpus luteum, is designated Lutein and causes the

secretory phase. Menstruation depends upon a balance of folliculin and lutein. Zondek³⁴⁴ reports that the test for Prolan A is positive in 81 per cent of cases of carcinoma of the female genitalia. In healthy women this reaction is never positive and in benign tumors of the genitals positive in 25 per cent of the cases.

Philipp^{345, 346} finds that in early pregnancy the placenta contains a large amount of "anterior lobe hormone." Prolan B is produced in the placenta.³⁴⁷

In the study of these hormones it is essential to have the substances in pure form. The female sex hormone has been isolated in pure crystalline form by Doisy, Veler, Thayer³⁴⁸ and Gustavson in this country, and by Butenandt in Germany. Zondek and Van Eweyk³⁴⁹ found that the female sex hormone was most easily obtained by precipitating it from the urine with salts of the heavy metals. Gustavson, Schochet, Lackner and Saunders³⁵⁰ employ a pump extraction method in their preparation of the female sex hormone.

A very ingenious method has been devised by Newell, Allen and Pratt³⁵¹ for the recovery of human ova from the tube. The authors conclude from their study that ovulation occurs between the twelfth and fourteenth day following the onset of the previous menses.

Stuckert³⁵² divides the ovarian hemorrhages into two groups, continuous bleeding from a ruptured graafian follicle and from a ruptured corpus luteum cyst. According to Greenhill³⁵³ there are only 73 cases of rupture of the corpus luteum recorded in the literature. Since then Mathieu and Holman,³⁵⁴ and Acken³⁵⁵ have cited additional observations. King³⁵⁶ discusses the similarity of certain luteal cysts with endometriosis. (It is evident that not all cases of ruptured corpus luteum cysts have been recorded in the literature.)

C. Jeff Miller³⁵⁷ presents a very interesting and vivid outline of the historical development of surgery of uterine and ovarian tumors. Credit is due to Ephraim McDowell as the first surgeon and gynecologist to remove an ovarian tumor. (This excellent treatise should be read by every student of gynecology.)

There are comparatively few cases of torsion of solid tumors of the ovary reported. Vitali³⁵⁸ describes the few symptoms that may be associated with this condition. In one case, cited by Fuchs,³⁵⁹ the fibroadenoma became separated from the ovary and was attached to the liver.

Mason and Hamrick³⁶⁰ review the causes of operative mortality in pseudomyxoma peritonei of ovarian origin chiefly due to pulmonary embolism and general peritonitis. Roentgen-ray or radium therapy is advocated in all cases.

Granulosa-cell tumors of the ovary appear to arise from embryonic rests of the ovarian parenchyma in the medullary portion of the ovary. TeLinde³⁶¹ reports three instances of such tumors, and one of the closely related oophoroma follicular group. Clinically these tumors occur most frequently after the cessation of the menses. Babes and Pantz-Lazarescu³⁶² believe that Krukenberg tumors arise from the differentiated and the undifferentiated mucinous cells forming adenocarcinoma located beneath the peritoneal surface of the stomach, ovary, spleen, and liver.

The typical teratoma is formed of derivatives from all three germ layers and their teratogenic period must be attributed to a very early

phase in the ontogenetic development. Bjorkenheim³⁶³ gives a detailed description of a teratoma in a young woman of twenty-one years in which the tumor mass was found in the culdesac of Douglas. Robert Meyer^{364, 365} describes six cases of typical tubular adenomas (testicular) of the ovary. Meyer has designated these tumors as "androblastomata" because the cells of the tumors are probably due to the effect of an internal secretion of the male elements.

REFERENCES

- (100) J. A. M. A. 95: 1221, 1930. (101) J. A. M. A. 94: 834, 1930. (102) J. A. M. A. 94: 833, 1930. (103) AM. J. OBST. & GYNEC. 19: 511, 1930. (104) Brit. M. J. 11: 201, 1930. (105) J. A. M. A. 95: 1222, 1930. (106) AM. J. OBST. & GYNEC. 19: 167, 1930. (107) AM. J. OBST. & GYNEC. 20: 500, 1930. (108) AM. J. OBST. & GYNEC. 20: 15, 1930. (109) Arch. di biol. norm. e path. 1930. (110) Zentralbl. f. Gynäk. 54: 1748, 1930. (111) Minnesota Med. 42: 172, 1930. (112) Colorado Med. 27: 127, 1930. (113) J. A. M. A. 95: 1148, 1930. (114) AM. J. OBST. & GYNEC. 19: 179, 1930. (115) J. A. M. A. 95: 1796, 1930. (116) AM. J. OBST. & GYNEC. 20: 633, 1930. (117) Am. J. Roentgenol. 24: 267, 1930. (118) Radiol. Rev. & Chicago M. Rec. 52: 128, 1930. (119) J. Obst. & Gynec. Brit. Emp. 38: 233, 1930. (120) Med. Klin. 26: 1, 1930. (121) J. A. M. A. 95: 13, 1930. (122) AM. J. OBST. & GYNEC. 20: 310, 1930. (123) Monatschr. f. Geburtsh. u. Gynäk. 84: 241, 1930. (124) Johns Hopkins Hosp. Bull. 47: 22, 1930. (125) Monatschr. f. Geburtsh. u. Gynäk. 86: 31, 1930. (126) Southern M. J. 23: 571, 1930. (127) J. A. M. A. 94: 155, 1930. (128) Monatschr. f. Geburtsh. u. Gynäk. 84: 319, 1930. (129) Zentralbl. f. Gynäk. 54: 2208, 1930. (130) Zentralbl. f. Gynäk. 54: 2208, 1930. (131) Acta obst. et gynec. Scandinav. 10: 111, 1930. (132) AM. J. OBST. & GYNEC. 20: 699, 1930. (133) Ann. ostet. e gynec. 52: 423, 1930. (134) Arch. ital. di gynec. 11: 1930. (135) AM. J. OBST. & GYNEC. 19: 367, 1930. (136) Ztschr. f. Geburtsh. u. Gynäk. 97: 299, 1930. (137) AM. J. OBST. & GYNEC. 19: 246, 1930. (138) Zentralbl. f. Gynäk. 54: 104, 1930. (139) Schweizer. med. Wchnschr. 60: 381, 1930. (140) J. A. M. A. 94: 601, 1930. (141) Arch. f. Gynäk. 142: 120, 1930. (142) Surg. Gynec. Obst. 50: 644, 1930. (143) Surg. Gynec. Obst. 51: 491, 1930. (144) AM. J. OBST. & GYNEC. 20: 51, 1930. (145) Virginia Med. Month. 57: 11, 1930. (146) Zentralbl. f. Gynäk. 54: 113, 1930. (147) Zentralbl. f. Gynäk. 54: 542, 1930. (148) Zentralbl. f. Gynäk. 54: 2626, 1930. (149) Zentralbl. f. Gynäk. 54: 773, 1930. (150) Bull. Soc. frang. de dermat. et syph. 37: 123, 1930. (151) Surg. Gynec. Obst. 51: 856, 1930. (152) AM. J. OBST. & GYNEC. 20: 103, 1930. (153) Surg. Gynec. Obst. 50: 990, 1930. (154) Zentralbl. f. Gynäk. 54: 2824, 1930. (155) Jap. J. Obst. & Gynec. 13: 115, 1930. (156) Arch. ostet. et gynec. 17: 198, 1930. (157) Zentralbl. f. Gynäk. 54: 514, 1930. (158) Ztschr. f. Gynäk. 98: 444, 1930. (159) AM. J. OBST. & GYNEC. 19: 641, 1930. (160) Western J. Surg. 38: 504, 1930. (161) J. A. M. A. 95: 1413, 1930. (162) AM. J. OBST. & GYNEC. 19: 839, 1930. (163) Brit. M. J. 1: 577, 1930. (164) AM. J. OBST. & GYNEC. 19: 822, 1930. (165) Bol. Soc. de obst. y gynec. de Buenos Aires 9: 124, 1930. (166) Med. J. Australia 1: 356, 1930. (167) AM. J. OBST. & GYNEC. 19: 548, 1930. (168) N. Y. State J. Med. 30: 887, 1930. (169) Zentralbl. f. Gynäk. 54: 2114, 1930. (170) Ztschr. f. Geburtsh. u. Gynäk. 98: 526, 1930. (171) Zentralbl. f. Gynäk. 54: 962, 1930. (172) Ztschr. f. Geburtsh. u. Gynäk. 97: 312, 1930. (173) Zentralbl. f. Gynäk. 54: 1827, 1930. (174) Ztschr. f. Geburtsh. u. Gynäk. 97: 351, 1930. (175) Kazansky Med. J. 26: 690, 1930. (176) Med. Klin. 45: 1930. (177) J. Obst. & Gynec., Brit. Emp. 37: 72, 1930. (178) J. Obst. & Gynec. Brit. Emp. 37: 1, 1930. (179) AM. J. OBST. & GYNEC. 19: 185, 1930. (180) Surg. Gynec. Obst. 50: 741, 1930. (181) Zentralbl. f. Gynäk. 54: 2702, 1930. (182) AM. J. OBST. & GYNEC. 19: 779, 1930. (183) Surg. Gynec. Obst. 50: 599, 1930. (184) Zentralbl. f. Gynäk. 54: 2135, 1930. (185) J. A. M. A. 94: 983, 1930. (186) J. A. M. A. 95: 153, 1930. (187) AM. J. OBST. & GYNEC. 19: 633, 1930. (188) J. A. M. A. 95: 1563, 1930. (189) Arch. Surg. 20: 637, 1930. (190) Monatschr. f. Geburtsh. u. Gynäk. 86: 197, 1930. (191) Edit. Surg. Gynec. Obst. 51: 561, 1930. (192) Surg. Gynec. Obst. 50: 688, 1930. (193) Edit. J. A. M. A. 94: 870, 1930. (194) J. Path. & Bact. 33: 119, 1930. (195) Arch. di ostet. e gynec. 16: 547, 1929. (196) J. A. M. A. 94: 625, 1930. (197) Edit. Surg. Gynec. Obst. 51: 262, 1930. (198) Edit. J. A. M. A. 95: 1350, 1930. (199) AM. J. OBST. & GYNEC. 19: 210, 1930. (200) AM. J. OBST. & GYNEC. 19: 520, 1930. (201) Monatschr. f. Geburtsh. u. Gynäk. 86: 58, 1930. (202) Arch. di ostet. e gynec. 17: 1, 1930. (203) Zentralbl. f. Gynäk. 54: 1986, 1930. (204) Surg. Gynec.

- Obst. 51: 133, 1930. (205) München. med. Wehnschr. 70: 97, 1930. (206) New England J. Med. 202: 1, 1930. (207) J. A. M. A. 95: 1985, 1930. (208) Klin. Wehnschr. 32: 1507, 1930. (209) Surg. Gynec. Obst. 50: 200, 1930. (210) Arch. di ostet. 17: No. 8, 1930. (211) AM. J. OBST. & GYNEC. 19: 654, 1930. (212) Ann. di ostet. e ginec. 52: 261, 1930. (213) AM. J. OBST. & GYNEC. 20: 66, 1930. (214) J. A. M. A. 95: 1602, 1930. (215) Surg. Gynec. Obst. 51: 125, 1930. (216) AM. J. OBST. & GYNEC. 20: 571, 1930. (217) Surg. Gynec. Obst. 51: 683, 1930. (218) AM. J. OBST. & GYNEC. 19: 285, 1930. (219) Surg. Gynec. Obst. 51: 321, 1930. (220) J. A. M. A. 95: 1097, 1930. (221) Surg. Gynec. Obst. 51: 500, 1930. (222) Gynéc. et obst. 26: 2, 1930. (223) AM. J. OBST. & GYNEC. 20: 481, 1930. (224) AM. J. OBST. & GYNEC. 20: 670, 1930. (225) Ztschr. f. Geburtsh. u. Gynäk. 96: 516, 1930. (226) AM. J. OBST. & GYNEC. 19: 335, 1930. (227) Zentralbl. f. Gynäk. 54: 578, 1930. (228) Zentralbl. f. Gynäk. 54: 1538, 1930. (229) Zentralbl. f. Gynäk. 54: 1542, 1930. (230) J. Lab. & Clin. Med. 16: 27, 1930. (231) AM. J. OBST. & GYNEC. 20: 595, 1930. (232) Deutsche med. Wehnschr. No. 33, 1930. (233) Ann. Surg. 91: 841, 1930. (234) Bordeaux Chir. 1: 1, 1930. (235) Lancet 218: 277, 1930. (236) Surg. Gynec. Obst. 50: 173, 1930. (237) AM. J. OBST. & GYNEC. 19: 457, 1930. (238) Clin. Ostet. 653, 1929. (239) Zentralbl. f. Gynäk. 54: 1357, 1930. (240) Radiol. Med. 17: 809, 1930. (241) Bull. Soc. di obst. et. Gynec. 19: 159, 1930. (242) Surg. Gynec. Obst. 50: 110, 1930. (243) Strahlentherapie 36: 403, 1930. (244) Am. J. Roentgenol. 21: 54, 1930. (245) New Eng. J. Med. 203: 247, 1930. (246) Am. J. Roentgenol. 24: 412, 1930. (247) AM. J. OBST. & GYNEC. 1930. (248) Med. Klin. 26: 699, 1930. (249) Radiology 14: 211, 1930. (250) AM. J. OBST. & GYNEC. 20: 443, 1930. (251) AM. J. OBST. & GYNEC. 20: 519, 1930. (252) Ann. di obst. 52: 309, 1930. (253) Ann. di obst. 12: 146, 1930. (254) Ztschr. f. Geburtsh. u. Gynäk. 98: 193, 1930. (255) J. A. M. A. 95: 1164, 1930. (256) München. med. Wehnschr. 34: 1456, 1930. (257) München. med. Wehnschr. 29: 1240, 1930. (258) J. A. M. A. 94: 489, 1930. (259) Ugeskrift for Laeger, Copenhagen 92: 837, 1930. (260) Surg. Gynec. Obst. 50: 873, 1930. (261) Therapie der Gegenwart 71: 452, 1930. (262) Arch. f. Gynäk. 141: 125, 1930. (263) Trans. Soc. Exper. Biol. In Press. (264) AM. J. OBST. & GYNEC. 20: 355, 1930. (265) AM. J. OBST. & GYNEC. 20: 129, 1930. (266) J. A. M. A. 95: 1557, 1930. (267) Boletín de la Soc. de Obst. y Ginec. de Buenos Aires 9: 245, 1930. (268) Rev. Franç. de Gynéc. et d'Obst., Paris 25: 81, 1930. (269) L'Osedale Maggiore di Novara 8: 760, 1930. (270) J. A. M. A. 94: 255, 1930. (271) J. A. M. A. 95: 1219, 1930. (272) J. A. M. A. 94: 489, 1930. (273) München. med. Wehnschr. 77: 225, 1930. (274) J. A. M. A. 94: 1204, 1930. (275) AM. J. OBST. & GYNEC. 19: 739, 1930. (276) Brit. M. J. 1: 629, 1930. (277) J. A. M. A. 94: 1615, 1930. (278) Fortschr. der Therap. 6: 458, 1930. (279) J. A. M. A. 95: 468, 1930. (280) AM. J. OBST. & GYNEC. 19: 77, 1930. (281) AM. J. OBST. & GYNEC. 19: 530, 1930. (282) J. Obst. & Gynec. Brit. Emp. 37: 256, 1930. (283) J. A. M. A. 94: 478, 1930. (284) Arch. f. Gynäk. 142: 514, 1930. (285) Surg. Gynec. Obst. 51: 55, 1930. (286) Rev. franç. de gynéc. et d'obst. 25: 159, 1930. (287) Proc. Soc. Exper. Biol. & Med. 27: 857, 1930. (288) Am. J. Roentgenol. 23: 125, 1930. (289) Zentralbl. f. Gynäk. 54: 3013, 1930. (290) J. A. M. A. 95: 1652, 1930. (291) J. A. M. A. 95: 1647, 1930. (292) Zentralbl. f. Gynäk. 54: 2183, 1930. (293) AM. J. OBST. & GYNEC. 20: 28, 1930. (294) Surg. Gynec. Obst. 50: 663, 1930. (295) Acta obst. et gynec. Scandinav. 10: Suppl. 1930. (296) J. A. M. A. 94: 1221, 1930. (297) Northwest Med. 29: 460, 1930. (298) AM. J. OBST. & GYNEC. 19: 381, 1930. (299) AM. J. OBST. & GYNEC. 19: 87, 1930. (300) Zentralbl. f. Gynäk. 54: 1025, 1930. (301) Arch. di ostet. e ginec. 17: 536, 1930. (302) Missouri M. A. 27: 327, 1930. (303) AM. J. OBST. & GYNEC. 20: 582, 1930. (304) Surg. Gynec. Obst. 51: 125, 1930. (305) Acta obst. et gynec. Scandinav. 10: 1, 1930. (306) Am. Rev. Tuberc. 22: 1, 1930. (307) AM. J. OBST. & GYNEC. 19: 430, 1930. (308) Fortschr. der Therap. 6: 1930. (309) AM. J. OBST. & GYNEC. 20: 81, 1930. (310) J. Obst. & Gynec. Brit. Emp. 37: 96, 1930. (311) Arch. ital. di chir. 25: 395, 1930. (312) Arch. ostet. e ginec. 17: 294, 1930. (313) Gynéc. et obst. 21: 103, 1930. (314) Folia Gynaec. 27: 13, 1930. (315) Klin. Wehnschr. 8: 351, 1930. (316) Zentralbl. f. Gynäk. 54: 94, 1930. (317) AM. J. OBST. & GYNEC. 19: 72, 1930. (318) Brit. M. J. 1: 1164, 1930. (319) Arch. di ostet. e ginec. 16: 1008, 1929. (320) Arch. di ostet. e ginec. 16: 711, 1929. (321) Rev. franç. de gynéc. d'obst. 25: 441, 1930. (322) Arch. ostet. e ginec. 17: 327, 1930. (323) Zentralbl. f. Gynäk. 54: 211, 1930. (324) Zentralbl. f. Gynäk. 54: 19, 1930. (325) Gynec. et ostet. 21: 439, 1930. (326) Arch. di ostet. e ginec. 17: 97, 1930. (327) Arch. di ostet. e ginec. 17: 409, 1930. (328) Zentralbl. f. Gynäk. 54: 2383, 1930. (329) Arch. f. Gynäk. 140: 573, 1930. (330) Zentralbl. f. Gynäk. 54: 2191, 1930. (331) Endocrinology

14: 28, 1930. (332) J. A. M. A. 94: 1197, 1930. (333) Canad. M. A. J. 22: 219, 1930. (334) Illinois M. J. 1930. (335) Acta obst. et gynec. Scandinav. 10: 63, 1930. (336) Riv. ital. ginec. 11: 1930. (337) Endocrinol. e patol. costit. 5: 70, 1930. (338) Arch. di ostet. e ginec. 17: 253, 1930. (339) AM. J. OBST. & GYNEC. 20: 1, 1930. (340) Zentralbl. f. Gynäk. 54: 1, 1930. (341) Klin. Wehnschr. 9: 245, 1930. (342) Deutsche med. Wehnschr. 56: 300, 1930. (343) Klin. Wehnschr. 9: 393, 1930. (344) Klin. Wehnschr. 9: 679, 1930. (345) Zentralbl. f. Gynäk. 54: 450, 1930. (346) Zentralbl. f. Gynäk. 54: 1858, 1930. (347) Zentralbl. f. Gynäk. 49: 3076, 1930. (348) Edit. J. A. M. A. 94: 341, 1930. (349) Klin. Wehnschr. 9: 1436, 1930. (350) (In press.) (351) AM. J. OBST. & GYNEC. 19: 180, 1930. (352) J. A. M. A. 94: 1227, 1930. (353) AM. J. OBST. & GYNEC. 19: 423, 1930. (354) Western J. Surg. 1930. (355) AM. J. OBST. & GYNEC. 20: 860, 1930. (356) Surg. Gynec. Obst. 50: 1, 1930. (357) J. Tenn. State M. A. 23: 201, 1930. (358) Ann. obstet. e ginec. 52: 364, 1930. (359) Zentralbl. f. Gynäk. 54: 2696, 1930. (360) Surg. Clin. North America 10: 61, 1930. (361) AM. J. OBST. & GYNEC. 20: 552, 1930. (362) Gynec. et obstet. 21: 465, 1930. (363) Acta obst. et gynec. Scandinav. 10: 163, 1930. (364) Zentralbl. f. Gynäk. 54: 3744, 1930. (365) Beitr. z. Path. Anat. u. a. allg. Path. 84: 485, 1930.

Correspondence

To the Editor.—A paper read by Dr. J. A. Calkins before the Norfolk County Medical Society in 1926, drew my attention to the use of bromides in large and systematic doses in the treatment of severe nausea of pregnancy.

DeLee's *Obstetrics*, 4th edition, 1924, briefly mentions bromide in 1-dram doses by rectum. The previous edition mentioned 30-grain doses which seems to be the prevailing practice today. I am aware that bromide is a time-honored remedy for this condition, but usually it has been used in insufficient dosage, and the results have not been marked.

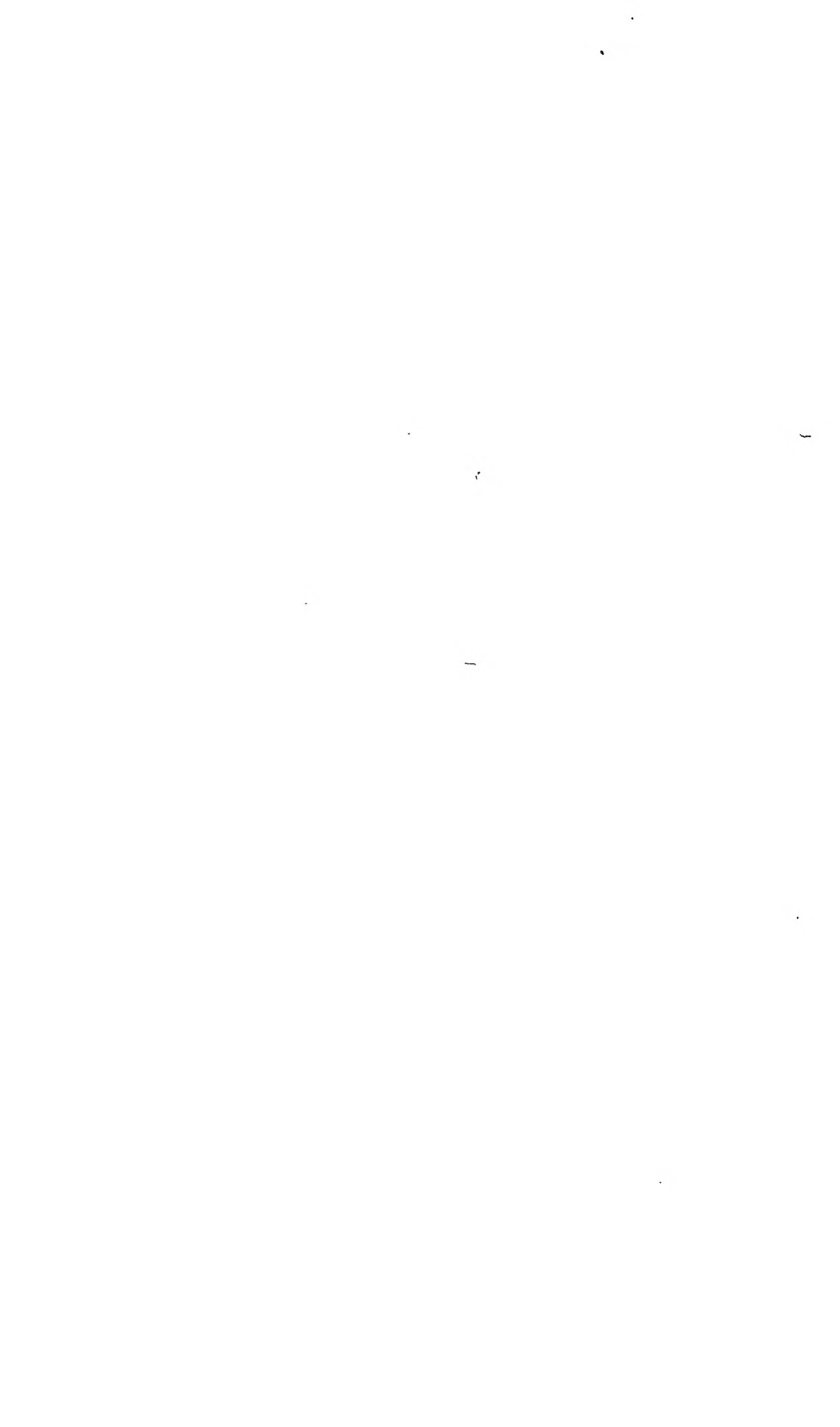
During the past decade a number of papers have been published on the subject, many mentioning bromide but not emphasizing dosage. The plan which I have followed is 1 dram of bromide per rectum every six hours' night and day until nausea is controlled, usually twenty-four to forty-eight hours, then reducing the dose and frequency as indicated. If acidosis is present glucose is given intravenously, saline by hypodermoclysis, and food as soon as it can be taken, which is usually about twenty-four hours. Other hygienic, dietary, and gynecologic methods are of course used as indicated. The early cases with less severe nausea are given 20 grains of bromide every six hours by mouth and decreased as the bromide level in the blood rises sufficiently to control symptoms.

Unfortunately bromide psychosis and dermatosis may appear in some of the more prolonged cases. During 1927, Otto Wuth of the Johns Hopkins Hospital (*J. A. M. A.*, 88: 2013), devised a method of quantitative detection of bromide in the blood. This gave a gauge by which we could determine the effect of the dose and anticipate danger. The best results appear after the accumulation of 100 or 150 mg. to 100 c.c. of blood, and more than 200 mg. has been found to give symptoms.

It has been shown that bromides in part replace the chlorides in the blood, and that sodium chloride given intravenously or by mouth relieves the excessive bromide retention. This work (except possibly the application of Wuth's work to an obstetric problem) did not originate with me, but these simple methods have been so extremely helpful in this troublesome condition that I take the liberty of calling your attention to it with the hope that you may have the opportunity of passing it on to your readers in some way.

C. J. ANDREWS, M.D.

NORFOLK, VA.



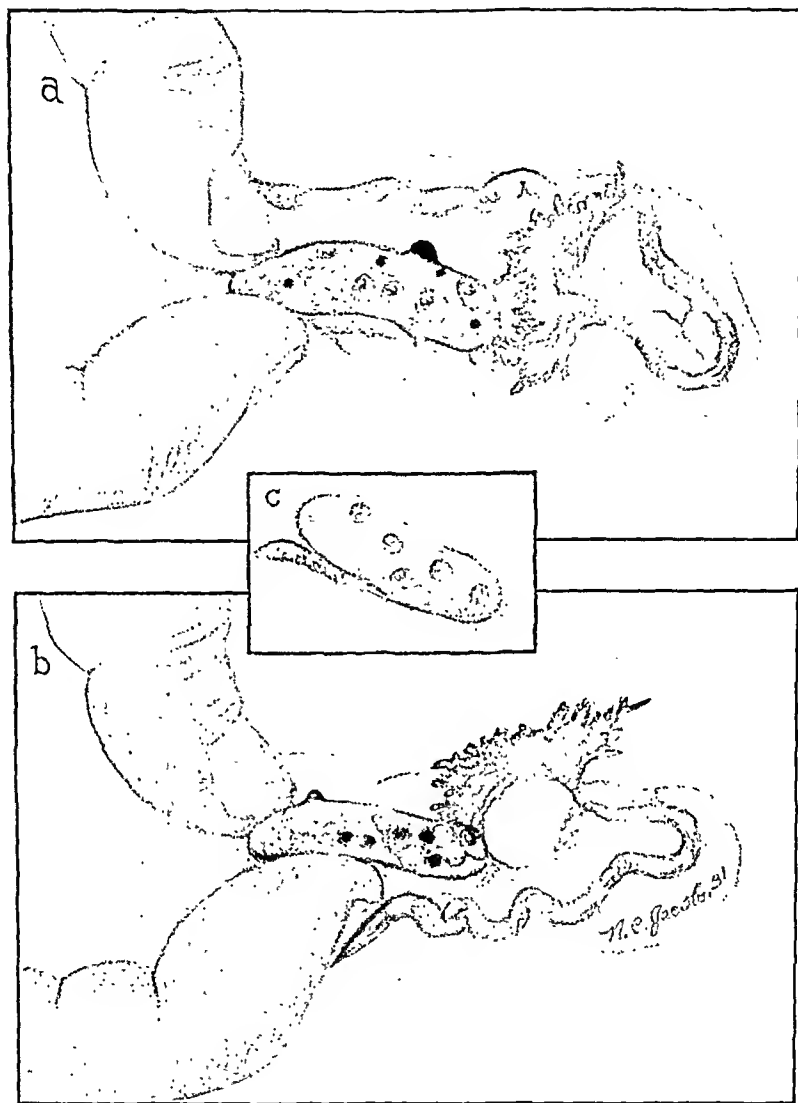


Plate I.—Rabbit ovulation test.

- a. Rabbit's ovary showing unruptured follicles and old dark hemorrhagic, unruptured follicles, a negative reaction.
- b. Recently ruptured follicles, bright red, conical or umbilicated elevations, a positive reaction.
- c. Ovary with unruptured follicles, a negative reaction.

American Journal of Obstetrics and Gynecology

VOL. XXII

ST. LOUIS, OCTOBER, 1931

No. 4

✓ Original Communications*

THE USE OF AN ANTERIOR PITUITARY LUTEINIZING SUBSTANCE IN THE TREATMENT OF FUNCTIONAL UTERINE BLEEDING†

BY EMIL NOVAK, M.D., AND GERALD B. HURD, M.D., BALTIMORE, MD.

(From the Gynecological Department, Johns Hopkins Medical School)

ONE of the most frequent and most difficult problems in gynecology is the management of cases of functional uterine bleeding, more particularly in young patients, in whom the importance of preserving the menstrual and reproductive functions is obvious. With patients who are at or near the menopausal era, the problem is easier, for the reproductive lives of these patients have been lived, and there is no great disadvantage in bringing about the menopause by radium or x-ray therapy.

Functional hemorrhage is often, however, encountered at or near puberty, during the adolescent period, or at any age during the reproductive epoch. When sufficiently severe, curettage is usually indicated for both diagnostic and therapeutic reasons. By this means hemorrhage, of even alarming character, can ordinarily be checked, temporarily at least. Unfortunately, recurrence takes place in the majority of cases, often soon after operation; in other cases perhaps not for many months. The gynecologist is then usually called on to decide between repetition of the curettage and treatment by radium. Efforts at organotherapy may of course be made, but up to the present time these have usually been found unsuccessful.

*NOTE: It was not found possible to include in this issue of the JOURNAL all of the papers read at this year's annual meeting of the American Gynecological Society. The remaining papers, together with the discussions, will be published in the November and subsequent issues.

†Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 19, 1931.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

In spite of the great advances in radiotherapy during recent years, the consensus of opinion among conservative gynecologists and radiotherapists is that radium treatment should be a last resort in young persons. This in spite of the fact that a proper regulation of the dosage will usually prevent a permanent effect on the menstrual function, and that recent work appears to indicate that no deleterious effect is produced upon the product of conception, if pregnancy supervenes at a later date. It is a well-known fact, however, that the individual variation in the reaction to radium is very great. In some patients the ovarian function is hard to "kill," while other patients are so susceptible that even small doses of radium may bring about permanent cessation of function.

For this reason, many gynecologists have preferred to treat the great majority of such cases with curettage, repeated as often as the severity of the bleeding may indicate. By this plan most patients may be tided over until a readjustment of the disordered endocrine balance takes place. That a tendency to spontaneous readjustment is common is shown in the many milder cases which recover without any treatment whatsoever, or after a single curettage. In several previous papers¹ the clinical characteristics of this type of bleeding, together with the characteristic ovarian and endometrial findings, have been fully elaborated, so that they need not be here discussed.

Several facts, however, are worthy of reemphasis as bearing upon the plan of treatment we are proposing. The ovaries of these patients show an absence of corpora lutea and a persistence of the unruptured graafian follicle. This would at once suggest that the ovarian disturbance consists of a persistence and relative excess of the follicle stimulus, with an entire absence of the progestin phase normally contributed by the corpus luteum.

This belief is confirmed by the findings in the endometrium of such cases, for there is never any evidence of the secretory activity which progestin produces in an endometrium previously primed with folliculin. That such a previous priming is necessary is indicated by the work of Allen,² Hisaw and Leonard,³ and others. It is the constant, prolonged, growth stimulus of the follicle hormone, without the secretory topping-off normally brought about by progestin, which is responsible for the type of endometrium seen with functional hemorrhage. Almost always it assumes the form of hyperplasia of the endometrium, characterized perhaps most conspicuously by its "swiss-cheese" gland pattern, as has been emphasized in the previous papers above alluded to.

The term hyperplasia is perhaps not an altogether happy one for this endometrial picture, for in only a fraction of the cases is there an overgrowth of the endometrial elements. The condition really represents a persistence and an exaggeration of the picture seen in the so-called interval phase of the endometrium. It is this phase which

corresponds with the period of estrus in the lower animals, and, like the latter, it is associated with full maturation of the follicle in the ovary. If the follicle fails to rupture, a corpus luteum is of course not formed, so that the estrus type of endometrium does not, as normally, pass on into the pregravid or secretory type produced by the corpus luteum. The continued effect of the follicle hormone, on the other hand, produces the hyperestrous picture commonly designated as hyperplasia of the endometrium.

Characteristic as this endometrial picture is of these cases of functional bleeding, it is not such a simple matter to explain the mechanism of the bleeding. Schröder⁴ believes that the hemorrhage occurs from very small localized areas of necrosis on the surface, but we have not been able to convince ourselves of the correctness of this view, although such areas of necrobiosis and thrombosis are often noted. It would be hard to believe that such punctate areas can produce the extremely abundant hemorrhages often seen. It seems more likely, since there is no such desquamation as with normal menstruation, that some change in the permeability of the blood vessels must be chiefly responsible for the bleeding. Just how this is brought about cannot be said.

That the endometrial lesion in itself cannot be responsible for the bleeding is indicated by the fact that exactly the same histologic picture may be found with amenorrhea. This observation, which we would formerly have looked upon as heretical and paradoxical, has been made by us now in a small number of instances. This number would no doubt be greatly increased if we had more frequent opportunity to study the endometrium in amenorrheic patients. The fact that hyperplasia is found in some cases of amenorrhea would seem to speak against Schröder's explanation of the source of bleeding in this condition. We believe that the cases of amenorrhea in which hyperplasia of the endometrium is found are the same group as those to which Zondek⁵ gives the designation of "polyhormonal amenorrhea." In this group he finds an excess of the follicle hormone even though the patient is amenorrheic. Quantitative studies of the hormone content are therefore not by any means of decisive importance in differentiating the type of disorder or in indicating the treatment to be followed.

The reason for this confusion lies, of course, in the rather intricate and as yet poorly understood hormone interrelationships of the ovary and other endocrine glands, particularly the anterior pituitary. This is not the place to discuss these at length, although they are touched upon in a later paragraph. This ovario-hypophyseal interaction is no doubt chiefly responsible for the alternating phases of long continued amenorrhea and persistent bleeding seen in some patients, especially as the amenorrheic phase is often combined with an adiposity similar to that seen in the familiar adiposo-genital dystrophy.

One of our patients offers a striking exemplification of this group. She had been eurented a few years ago for profuse bleeding, the endometrium showing a typical hyperplasia. Following this she exhibited periods of amenorrhea lasting as long as seven months, with an occasional normal menstrual period. At the same time she gained a great deal of weight, the fat distribution being of the so-called hypopituitary type. Six months ago she again began to suffer with profuse menstrual bleeding, lasting from two to two and a half weeks, with cessation for only a few days before the advent of the succeeding period. At the same time there was a moderate loss of weight. Since hyperplasia may be associated with either amenorrhea or excessive bleeding, it seems quite certain that some other element, as yet not known, must be added to the follicle hormone excess apparently responsible for the hyperplasia. What this additional factor is we do not know, but it is obviously to be looked upon as a bleeding factor, as will be discussed later in this paper.

The participation of the pituitary in the etiology of functional hemorrhage is further suggested by the fact that a considerable number of cases appear to follow full-term pregnancy or miscarriage. It is a well-known fact that the anterior hypophyseal lobe undergoes marked hypertrophy during gestation, and to this, indeed, are attributed the acromegaloid changes at times seen in late pregnancy, such, for example, as enlargement and coarsening of the features. These acromegaloid changes commonly disappear shortly after delivery, but the occasional case passes on into a genuine acromegaly. Other favorite periods for the development of the latter disease are puberty and the climacteric, when again there occur pronounced changes in pituitary activity.

These observations are of course only suggestive, as far as a possible corresponding rôle of the anterior pituitary in the etiology of functional bleeding is concerned. They are given no little support, however, by the recent work of Smith and Engle,⁶ and Zondek and Ascheim,⁷ demonstrating the subordinancy of the ovarian function to that of the anterior hypophysis. An observation of great importance, and one which we stress because of its bearing upon our immediate topic, is that recently made by Hartman, Firor, and Geiling⁸, as to the immediate cause of the uterine bleeding in monkeys. It has been generally assumed that menstrual bleeding is due to the withdrawal of the corpus luteum hormone with the beginning of retrogression in that structure. The cause of this retrogression is still unexplained. The studies of Hartman, Firor and Geiling, however, lead them to conclude that the cause of the uterine bleeding is a positive and not a negative factor, i.e., that it is due to "an active substance originating outside the ovaries." Their experiments convince them that this substance is originated in the anterior hypophysis. They show that the "administration of anterior lobe hormone in any form—implants of fresh gland,

or intraperitoneal injection of triturated gland tissue by trocar, or injections of acid or alkaline extract—all result in bleeding, whether the animal be normal, sick and amenorrhoeic, castrated or hypophysectomized, old or young.” The recent report of Hofbauer,⁹ again, indicates that injections of an anterior pituitary extract can bring about in animals (guinea pigs) an endometrial picture resembling hyperplasia.

The observations of Hartman and his associates may be accepted as demonstrating that uterine bleeding in the monkey may occur under the influence of a factor outside the ovary, and probably originating in the anterior pituitary lobe. We do not believe, however, that it can be accepted that this same factor is responsible for the bleeding of normal menstruation. The bleeding which the above named observers produced seems rather comparable to that occasionally observed in women in the interval period; i.e., the period corresponding to estrus in the lower animals. Following this period in the human cycle, however, there comes a prolonged up-building phase produced by progesterin, which apparently possesses anti-ovulation and anti-bleeding properties. What causes the cessation of the progesterin phase and the supervention of bleeding is not known. While a positive bleeding factor may here again be concerned, this has not yet been demonstrated, and it is still possible that the bleeding may be a withdrawal phenomenon, dependent upon the rather abrupt removal of the progesterin influence.

The observation in the work of Hartman and his associates which we would especially emphasize is that “the threshold for the bleeding phenomenon is immensely lower than that for growth and congestion of the uterus and ovaries.” They were able to produce bleeding in normal or ovariectomized animals with very moderate dosage of the anterior lobe hormone, and the same result is obtainable, as many others have found, with moderate doses of the follicle hormone. With the latter there is of course no effect upon the ovaries, if these be present.

This is in line with the important studies of Marrian and Parkes,¹⁰ who found that, in 50 per cent of the ovariectomized mice which they studied, the amount of follicle hormone necessary to produce copulation and the uterine changes of estrus is about two hundred times that required to induce the vaginal cornification changes which constitute the standard for the Allen-Doisy test. They very properly emphasize that the application of this fact to the human problem would indicate that in the woman, weighing about 2000 times as much as the mouse, the amount of follicle hormone required to produce histologic changes in the uterus would be 2000×200 , or 400,000 mouse units. This observation, as they remark, makes our present efforts at follicle hormone therapy seem very fantastic.

Practically all investigators who have studied the question agree that the anterior lobe produces two hormones, one of which is concerned with

follicle growth and ripening, the other with the process of luteinization. Evans and Simpson,¹¹ Crew and Wiesner,¹² and Zondek¹³ all agree on this point, although they apply different designations to the two substances. In addition to these two, there are of course still other hormones produced in the anterior lobe, but with these we are not directly concerned in this paper. To adopt Zondek's classification, his prolan A has to do with the motivation of follicle ripening and maturation, while his prolan B fulfills the same rôle with regard to luteinization.

It is now well known that the function of the anterior pituitary increases, in what Zondek speaks of as an explosive fashion, with the occurrence of pregnancy. Large amounts of the anterior pituitary hormones are produced, so that large amounts are found in the urine. It is on this overflow of the hormones in the urine that the Aschheim-Zondek test is based. Zondek¹⁴ was able to separate the pituitary hormones in aqueous solution from the urine of pregnant women, giving this watery extract the name of "prolan." Of the five anterior pituitary hormones which have been described, at least three are contained in Zondek's prolان. These are the follicle-stimulating hormone, or prolان A, the luteinizing hormone, or prolان B, and the metabolic hormone. The growth hormone alone is absent. The two important hormonal principles, prolان A and prolان B, cannot as yet be readily separated, although the former has been obtained in unmixed form, and Aschheim is said to have obtained the B principle from the gland itself. The dominant action of the urine in pregnancy, especially in the earlier stages, is that characteristic of prolان B., i.e., luteinization. The injection into a rabbit of prolان, containing both principles, brings about extensive luteinization, so that according to Zondek,¹⁵ the ovary can be almost converted into a mass of lutein tissue. The ovaries, normally the size of lentils, become as big as cherries. At the same time there is a profound effect upon the genital organs, the uterus becoming much enlarged and of bluish-red hue, like that seen in early pregnancy. The endometrium presents a picture like that seen in early pregnancy.

It is these changes in the ovary and uterus which we wish to stress, for upon them was originally based the treatment we have been employing in functional bleeding. As has been said, the characteristic ovarian finding in these cases is the entire absence of any lutein tissue, so that, as might be expected, one never finds in the endometrium any of the changes known to be due to the effect of progestin, and only progestin, as shown by Corner and Allen.¹⁶ This is especially true as regards the complete absence of any secretory activity in the epithelium. One of us (Novak)¹⁷ has repeatedly urged that if an active extract of the corpus luteum were available, it should be possible to transform the nonsecretory hyperplastic endometrium of these bleeding cases into a secretory, pregravid type, with probable completion of the cycle and

cessation of the bleeding. So far, however, progestin has not been prepared in a form suitable for administration to the human being. Even if it were, its effect, like that of the follicle hormone, would be a purely substitutional one, for it apparently has no effect upon the ovary.

With the demonstration of the two separate hormones in the anterior pituitary lobe, it seemed to us that if it were possible to secure a preparation of the luteinizing principle, an even more fundamental plan of treatment would be opened up to us. With such a preparation it should be possible to convert the granulosa cells of the ovary into lutein cells, so that the latter would themselves produce the progestin lacking in the cases with which we were attempting to deal.

Such a preparation has been made available to us through the courtesy of the Department of Experimental Medicine of Parke, Davis & Company, although we believe that it was intended primarily for use in cases of amenorrhea. It seemed to us, however, that a far more important field for its use was in the treatment of functional hemorrhage. Amenorrhea is rarely a serious condition, and, although the new preparation would be a rational one to employ as a part of the treatment of amenorrhea, the indication seemed less specific and less important than in the bleeding cases.

In regard to the method of preparation of the luteinizing hormone used in this work, it may be stated that the urine from pregnant women is concentrated and subjected to precipitation with water-soluble organic solvents, such as alcohol and acetone, thereby removing a large amount of inert material. In later work dialysis methods have been applied. The method is still admittedly imperfect, but will no doubt be improved from time to time. It can already be stated that the methods initially described by Zondek are unsuitable for the practical preparation of a stable product, but progress is being made in developing new methods.

The preparations which we have used have been very variable in their potency in animals, some producing marked luteinization while with others the response has been much feebler. Our clinical results have almost paralleled these laboratory variations. The chief difficulty in the preparation of the substance has been in its rather rapid deterioration, although it is hoped that this will soon be overcome. It is probable, too, that very potent luteinizing preparations will soon be available in water-soluble form. Loeser¹⁸ has been able to secure very effective preparations of prolun in powder form ("Acetontrockenpulver"), although this is not water-soluble.

The material we have been using has been entirely freed of the follicle hormone. It is certainly nontoxic and nonirritating. In short, it is apparently a perfectly safe preparation of the urine of pregnancy, and this urine is known to contain the anterior pituitary hormone the effect of which is desired. Though both prolun A and prolun B are present, the dominant action is that of the luteinizing hormone. This is

exactly what we would expect when we consider that in early pregnancy the ovary contains a large amount of lutein tissue, represented by the corpus luteum of pregnancy and perhaps also by a considerable amount of theca lutein tissue. Furthermore, follicle activity is in abeyance at this stage. The explanation for this dominantly luteinizing effect of prolan is given by the work of Wiesner,¹⁹ who found that prolan A rapidly deteriorates, soon losing its effect on mere standing. Furthermore, Wiesner states that the maximum effect of prolan A is reached long before that of prolan B, so that the effect of their combined administration in maximum dosage is that of the prolan B; i.e., luteinization. The preparation we have been using is therefore standardized for prolan B, the standard of potency being the production of definite luteinization changes in the ovary. The unit of dosage is the rat unit, this being the smallest amount bringing about such changes in a rat of standard weight.

When it comes to the question of dosage for clinical administration, we have had no standards for guidance. On the basis of Wiesner's work, large doses seemed desirable, and we have rather arbitrarily chosen 200 rat units as a daily dose for the intramuscular treatment in our cases. This is somewhat larger than that used by Zondek²⁰ in the treatment of a different group of cases, but we felt that this was justified because of the luteinizing effects of maximum doses (Wiesner), by the greater urgency of bleeding as a symptom, by the harmlessness of the preparation, and by the presumable freedom from certain risks emphasized by Zondek in the management of amenorrhea. In the latter condition, according to Zondek, there is danger, if too much is used, of producing luteinization before ovulation can occur, and thereby imprisoning the ovum within the luteinized follicle. This occurrence would, we believe, be of no significance in cases of functional bleeding, when the end desired is luteinization on as rapid and extensive a scale as possible, and without regard to whether or not ovulation takes place.

Our original idea in the use of this preparation, therefore, was to try to bring about luteinization of the granulosa cells in the ovary, with the mobilization of progestin, and thus to transform the characteristic "stationary hyperplasia" picture in the endometrium to a pregravid one. The explanation of the good results which we have obtained, however, is almost certainly not so simple as this. For example, in some of our cases in which bleeding had been present for many weeks, cessation was noted after even a single injection. The smallness of the dose, and, even more, the rapidity of the effect, would seem to preclude the mechanism we had presupposed. The most likely explanation would seem to be that the effect is exerted upon the still unknown bleeding factor which, as already stated, determines the occurrence or non-occurrence of bleeding with hyperplasia of the endometrium. Whatever the factor is, it would seem that it is in some way bound up with

a disturbance in the balance between the two anterior pituitary hormones. An excess of the bleeding factor and a deficiency or absence of the lutein tissue and its hormone appear to go together.

The administration of prolan B fills a physiologic gap, and appears to exert upon the bleeding a far more rapid and precise effect than it can possibly exert on the ovarian and endometrial histology. This is in line with the conclusions of Hartman and his coworkers⁸ and of Marrian and Parkes,¹⁰ indicating that the threshold of uterine bleeding is at least 200 times less than that of the production of actual histologic changes in the genital mucosa. In a converse fashion, it would seem that the bleeding in cases of the functional type which we are discussing is much more quickly influenced than is the endometrial or ovarian histology. These considerations show the impossibility as yet of a complete explanation of the good results obtained in our cases, because it is still impossible to explain the mechanism of the bleeding in cases of this group. We do believe, however, that the method of treatment is a rational one, being in conformity with what we thus far know of the puzzling interrelationships of the anterior pituitary and gonadal hormones. Loeser and others have been able to prepare very potent extracts of prolan in dry powdered form (acetontrockenpulver), and this may be the solution of our difficulty. We have been given assurance by the Research Department of Parke, Davis and Company that water soluble solid extracts of undoubted luteinizing potency can be prepared, and we hope to be able to improve our results when these are made available.

RESULTS

In all we have thus far treated 51 cases by this method. These patients were observed in the private practice of one of us, in the out-patient gynecological clinic of the Johns Hopkins Hospital, and in the practices of a number of colleagues. Of the 51 patients no less than 32 had had previous curettements, with no benefit, or at best, only temporary relief. In a considerable number more than one curetting had been done; in several, as many as four. The ages of the patients varied from fifteen to fifty-one years, but only 10 of these cases were of the menopausal type. In other words, the majority of the patients were of an age at which radiotherapy would have been undesirable.

In all but 7 patients of the series the bleeding was checked, in many with astonishing rapidity. Moreover, we feel justified in stressing the fact that we have worked with preparations of varying potency, as determined by laboratory studies of their luteinizing properties. Our first batch of material, for example, was reported as being strongly luteinizing, and 27 of the 29 patients for whom it was used were promptly relieved of bleeding, even though this, in some patients had been present for many weeks. The other 5 failures were all noted in cases in which we had been told to expect lower potency.

In some of our patients the bleeding was in the nature of hypermenorrhea; i.e., the menstrual periods were much prolonged and excessive. In other cases the patients have had metrorrhagia of greater or less duration. If bleeding was in progress when the patient came under observation, the injections were begun at once. If the hypermenorrhoeic patient was not bleeding at the time, the first injection was given as soon as the flow reappeared.

In 14 patients the bleeding was checked after one injection; in 14 after two; in 9 after three; in 3 after four; in 3 after five; and in 1 after six. These results, as we shall emphasize later, have to do with the immediate bleeding attack alone, and are not meant to apply to the matter of permanent relief. In a considerable proportion of these cases, the patients were treated during more than one bleeding period, but these "repeats" are not included in the above figures.

IS THE TREATMENT OF TEMPORARY OR PERMANENT VALUE?

This question we cannot as yet answer, as we have been employing the plan only a few months. Even if the beneficial results of the treatment pertain only to the bleeding attack, it would still be of great value. There are few women who would not prefer a number of hypodermic injections to curettage or radiotherapy. However, there is reason to believe that the benefits of the treatment may be of more lasting value. In a few cases in which, after obtaining good results in one bleeding attack, we have persuaded the patients to go through the next menstrual period without treatment, the flow has not been abnormally free. Furthermore, if we are successful in obtaining more strongly luteinizing preparations, we believe that we may be able to produce actual luteinization in the human ovary just as this can be produced in that of the laboratory animal. We are hoping that opportunities may later come of studying the ovaries and the endometriums of patients who have been subjected to this method of treatment, as this would give us direct evidence as to whether one can produce actual luteinization in the ovary, and, in the uterus, the conversion of the hyperplastic endometrium into a pregravid one.

THE INTRAVENOUS USE OF PROLAN

When we began our work, we were not aware that any previous attempts had been made to treat functional hemorrhage by preparations of prolan. In a recent publication, however, Zondek²¹ mentions that he has employed prolan intravenously for this purpose, and with good results. His object, like ours, was to bring about luteinization in the ovaries, and also, as he says, the prevention of follicle ripening. He gives no details of his results. We do not see the necessity for the intravenous method of treatment, especially if, as we believe, the good results are brought about by an effect upon a factor much more readily influenced than the histologic condition of the ovaries.

It is possible that the intravenous method may be far more potent in the production of ovulation than the subcutaneous route, as in the case of the rabbit, but this has not been established for the human being. If good results can be obtained from the simple intramuscular injections which we have been employing, this route would seem the preferable one. However, we hope later to be able to compare the results obtained by the two methods of administering the substance.

The only other report on the subject which we have been able to find is a short one by Martin²² on the treatment of 12 cases of various types of hemorrhage by prolan. Its use in this group, which included several of functional hemorrhage, was apparently semi-empiric, although good results were obtained in 10 of the cases.

SUMMARY

The present report deals with the treatment of 51 cases of functional uterine hemorrhage by an anterior pituitary luteinizing principle derived from the urine of pregnant women. In 44 of these the treatment was successful in checking the bleeding, even though some of our patients were treated with preparations of somewhat uncertain luteinizing potency. Most of the failures were in this group. Previous efforts at the organotherapy of this condition have been unsuccessful. Radiotherapy is very undesirable in young women, so that, because of the frequent intractability of functional hemorrhage, many patients have had to submit to repeated curettage.

The characteristic ovarian finding in these cases is an absence of corpora lutea. The administration of progesterin, if this were available, would be a rational plan of treatment. Progesterin is not yet available for human administration, and its effects would, moreover, be purely substitutional, as it has no effect on the ovaries. The administration of the luteinizing hormone of the anterior pituitary (prolan B) can be expected to be more fundamental in its effects. This substance has been shown by laboratory studies to produce striking luteinization in the ovary, and the secretion of the lutein cells is progesterin, the element lacking in functional hemorrhage. The hormone can be obtained from the urine of pregnant women, although its extraction is as yet somewhat difficult, and the preparations with which we have worked have been of very variable potency.

With strongly luteinizing preparations, it has been possible to check functional hemorrhage in 27 of 29 cases. In 14 of our 51 cases the bleeding has ceased after a single injection, and in 12 after two injections. A large proportion of these cases were of the intractable and recurrent type, many having had from one to four or more curettements. With less potent luteinizing preparations, the results have been less impressive, but on the whole satisfactory. Our experience with the entire group has convinced us of the value of the treatment in functional hemorrhages, and of its even greater future possibilities. This opinion seems a compelling one even though, in the nature of things, the results cannot be controlled with the precision of laboratory experiments.

The rapidity of the effect in many cases makes it seem certain that the immediate effect, at least, is not brought about through the production of lutein tissue and progesterin by the ovary. We believe that this immediate effect is exerted upon the still unknown bleeding factor

which is the immediate cause of the bleeding in functional hemorrhage, and which is influenced by far smaller dosage than would be required to produce histologic changes in the ovary. This view we base upon recent investigations on this bleeding factor and on studies upon the relative dosage required to bring about the various stages of estrus. These are discussed in the paper.

It is hoped that improvements in results will come with improvements in the methods of preparation of this substance, and, quite possibly, in its preparation in water-soluble solid form. Whether the intravenous method of administering prolan will yield results more favorable than the intramuscular route remains to be seen.

REFERENCES

- (1) *Novak*: Am. J. Obst. 75: 996, 1917; J. A. M. A. 75: 292, 1920; Am. J. OBST. & GYNEC. 8: 385, 1924 (with Martzloff). (2) *Allen*: Am. J. Physiol. 92: 612, 1930. (3) *Hisaw and Leonard*: Am. J. Physiol. 92: 574, 1930. (4) *Schröder*: Der mensuelle Genitalzyklus des Weibes. Veit-Stoeckel Handbuch der Gynäkologie, Vol. 1, Part 2, p. 309. (5) *Zondek*: Klin. Wehnschr. 9: 245, 1930. (6) *Smith and Engle*: Am. J. Anat. 40: 159, 1927. (7) *Zondek and Aschheim*: Arch. f. Gynäk. 130: 1, 1927. (8) *Hartman, Firor, and Geiling*: Am. J. Physiol. 95: 662, 1930. (9) *Hofbauer*: Zentralbl. f. Gynäk. 54: 2569, 1930. (10) *Marrian and Parkes*: J. Physiol. 69: 372, 1930. (11) *Evans and Simpson*: J. A. M. A. 91: 1337, 1928. (12) *Crew and Wiesner*: Proc. Royal Soc. Edinburgh, 1929. (13) *Zondek*: Klin. Wehnschr. 9: 393, 1930. (14) *Zondek*: Klin. Wehnschr. 8: 157, 1929. (15) *Zondek*: Klin. Wehnschr. 8: 157, 1929. (16) *Corner and Allen*: Am. J. Physiol. 88: 326, 1929. (17) *Novak*: J. A. M. A. 91: 607, 1928. (18) *Loeser*: Klin. Wehnschr. 9: 1856, 1930. (19) *Wiesner*: Edinburgh M. J. 37: 73, 1930. (20) *Zondek*: Klin. Wehnschr. 8: 2229, 1929. (21) *Zondek*: Arch. f. Gynäk. 144: 133, 1930. (22) *Martin*: Deutsche med. Wehnschr. 56: 580, 1930.

26 EAST PRESTON STREET.

Haberlandt, L.: The Hormonal Sterilization of the Female Organism. Monatschr. f. Geburtsh. u. Gynäk. 87: 320, 1931.

Haberlandt was the first to suggest the possibility of producing temporary sterilization by means of the injection of hormones. It was found that the substance which inhibits the ovary may be found not only in the ovary but also in the placenta. A few years ago the author outlined the clinical and eugenic indications for temporary sterilization. Since then, hormonal sterilization has been performed in women in Russia by means of injections of placenta extract. The difficulty consists in making a potent yet harmless preparation for clinical purposes. The substances used by Haberlandt in animal experiments are too weak for clinical use, but he hopes that the inhibitory element of the female sex hormone will soon be separated from the stimulating element and will be available for the purpose of temporary sterilization.

J. P. GREENHILL.

THE RESULTS OF THE RABBIT OVULATION TEST IN THE DIAGNOSIS OF PREGNANCY*

BY KARL M. WILSON M.D., AND GEORGE W. CORNER, M.D.
ROCHESTER, N. Y.

*(From the Department of Anatomy and the Department of Obstetrics and
Gynecology of the University of Rochester)*

THEORY AND METHOD OF THE TEST

IN DESCRIBING our results with the rabbit ovulation test for pregnancy it will not be necessary to discuss the biologic basis upon which it rests, since the reader will find the subject well covered in a recent review by Aschheim (1930) dealing with the Aschheim-Zondek test, and in another by Friedman upon the rabbit test, of which he is the original proponent. It will suffice to say that the urine of pregnant human females, after about the third week, contains large quantities of substances resembling in their effects the gonad-stimulating hormones of the anterior lobe of the hypophysis. The Aschheim-Zondek test and the rabbit ovulation test are simply two different methods for obtaining evidence as to the presence or absence of the hormones in question, in a given sample of urine. The former is performed by giving daily injections of the urine in question to immature mice; at autopsy after five days the ovaries are examined directly for signs of stimulated growth and function. The rabbit test of Friedman depends upon the fact that rabbits, which (unlike most other mammals) do not normally mature and rupture their graafian follicles except after copulation, may be made to ovulate without copulation by giving them an intravenous injection of the gonad-stimulating hormones as found in the hypophysis and in the pregnant urine.

Having ourselves a long experience in the study of the physiology of reproduction, we were at once interested in Friedman's suggestion in his paper of 1929 that the facts outlined above might be used for a rapid and accurate clinical test for pregnancy. One of our students, Mr. J. J. Jares, was, we believe, the first to confirm and extend Friedman's results, and in the spring of 1930 we began intensive trial of the method in the clinic. Owing to the fact that the work reported in this paper was begun and largely completed before the publication of other reports upon the test, we were under the necessity of working out for ourselves the practical details and standards of the test. For this reason our routine differs much from that given by Schneider and to a less degree from that of Friedman and Lapham.

*Read at the Fifty-Sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

Technic of Test.—Ordinary voided specimens of urine are received from the clinic and stored in the laboratory ice box until used. Positive specimens remain active for many months, so that they may be sent by mail from distant points, or reserved for retesting, without risk. The test is begun by giving to a suitable rabbit, usually (for convenience) at about 5 P.M., an intravenous injection, without sterile precautions, of 5 c.c. of the urine.

We use only fully adult female rabbits, of four pounds weight or over, which have been kept in strict isolation for one month or more. The principles upon which this practice is based are clearly given by Friedman and Lapham on page 406 of their paper. Trained investigators familiar with the reproductive physiology of rabbits, and technicians of long experience with the test may, as stated by Friedman and Lapham, relax the rule in emergencies, but this would be unsafe for others using the test.

The next morning at 9:00 A.M. or later, that is to say at sixteen hours or more after injection, the rabbit is prepared for operation under ether anesthesia by aseptic technic and explored through a mid-line abdominal incision. A positive result is determined by the presence in the ovaries of recently ruptured graafian follicles, indicated as shown in the Plate I, Fig. *b*, by bright red elevations of conical form, a millimeter or two in diameter, having usually a very small depression in the center. Inexperienced observers may possibly find it difficult to distinguish these ruptured follicles from large unruptured follicles which are sometimes present, especially if the vessels in the latter are somewhat engorged. The unruptured follicles are rounded rather than conical or mammillary in form, show no central stigma or depression, and are much paler and clearer. A hand lens may aid in the discrimination. Still more confusing are the rather frequently present hemorrhagic unruptured follicles, more or less peculiar to the rabbit. These are usually of dull red color approaching black, and are generally smaller and less prominent than the ruptured follicles. As a safeguard for beginners we have illustrated such hemorrhagic follicles in Plate I, Fig. *a*.

Another finding sometimes encountered is that of very large clear follicles, apparently just on the verge of rupture, suggestive of some ovarian stimulation. In the presence of such findings we have in a number of instances repeated the test, using a larger quantity of urine (10 c.c.) and allowing a longer period to elapse before the animal was explored. This has not changed the results, and we have reported such findings as negative.

After observation of the ovaries the abdominal wound is closed with silk and the animal returned to isolation for subsequent use. Mr. Jares found that a second ovulation may be induced within a few days of the first, and therefore, if necessary, the animals can be used again without a long interval, but in order to spare them the ill effects of too frequent exploration it is our custom to use each animal about once a month. They withstand, on the average, five or six explorations before adhesions or bad healing terminate their usefulness. We have had only one instance of difficulty due to toxicity of the urine.

It will be noted that the chief difference between our routine and that of Friedman and Lapham is that we read the test after sixteen hours while they feel that it is advisable to wait forty-eight hours to eliminate the possibility of delayed reactions. The high level of accuracy, attained in our investigation, quite equalling that of the Aschheim-Zondek test and of the rabbit ovulation test as applied by Friedman and Lapham, seems to indicate that the shorter test period does not lead to inaccuracy. One of the great advantages of the rabbit test over the Aschheim-Zondek test is the possibility of making

the diagnosis overnight, and in case of doubt a test may be checked by a repetition within forty or forty-two hours from receipt of the original specimens.

Schneider uses young rabbits (sixteen weeks old). At this age the animals are not quite mature sexually, and thus a positive test involves not only ovulation but also preliminary changes in the ovary to bring it into the mature state. Presumably for this reason Schneider waits thirty hours before autopsying his rabbits.

Experience alone will tell whether it is more economical to examine the rabbits, as we do, by operation rather than by autopsy. It cuts down turnover in the colony and lowers the purchase cost per test, but requires a trained technician and sterile supplies for the operations.

While we have recently made use of this procedure as a diagnostic aid in a considerable number of cases, the object of the present study has rather been to determine its real value from the standpoint of clinical diagnosis, and to learn what possible sources of error, if any, may be present. We have therefore carried out observations on a relatively large series of women in various stages of pregnancy, and the puerperium, on abnormal pregnancies, on women presenting menstrual disturbances, as well as on a series of patients presenting a miscellaneous variety of pathologic lesions.

A small series of observations, 16 in all, were made on women at the end of pregnancy, daily specimens of urine being obtained from the same women for the first few days of the puerperium. This was done to determine how long the reaction remained positive after pregnancy had terminated. In this series, all gave a positive reaction during pregnancy, the reaction becoming negative within twenty-four to seventy-two hours postpartum, though in only two instances did it remain positive for a longer period than forty-eight hours. This time factor differs somewhat from that observed in the Aschheim-Zondek reaction, which only becomes negative seven to eight days after delivery.

Those women upon whom observations were made in the early periods of their pregnancies represent a most important group from the diagnostic standpoint. Tests were carried out upon the urine from eighteen women who were presumably in the first month of pregnancy. True, the exact duration of the pregnancies was not known, and had been estimated from the menstrual history and the lack of development of the uterus; but inasmuch as in all these women not more than thirteen days had elapsed since a menstrual period had been missed, and the uterus showed little or no change, it seems fair to assume that they were not more than four weeks pregnant. In three of the women only eight days had elapsed since the menstrual period had failed to appear. In all of these 18 cases a positive result was obtained. In 30 other women who from similar criteria were presumably from four to

eight weeks pregnant, the urine also gave a positive result. All of these women were observed subsequently and the diagnosis of pregnancy fully confirmed.

In addition to these, three other women were observed in whom ten to thirteen days had elapsed since the missed period, and who were also presumably in the first month of their pregnancies. Their urine gave a negative reaction at the first examination, but four to seven days later, the reaction became positive. Subsequent examinations confirmed the diagnosis of pregnancy. In these three instances, possibly conception had occurred at a slightly later date than in the first group. These findings would also indicate the advisability of repeating the test in the doubtful early case.

In three other women, who had myomatous uteri, and who were presumably from two and a half to three months pregnant, the test was also positive, and again subsequent examinations established the diagnosis of pregnancy.

Our earliest known case is worthy of special mention. This woman gave the history of having menstruated last on July 4, 1930. She was admitted to the hospital on account of a rather large myomatous uterus. Examination offered no suggestion of pregnancy and the urine was not tested. Hysterectomy was done on July 24, 1930, and on opening the uterus an early ovum, of not more than three weeks development, was discovered. (This is being prepared for embryologic study.) A specimen of urine obtained eight hours after operation gave a positive reaction.

The results obtained during pregnancy may be tabulated as follows:

FULL-TERM PREGNANCY AND PUERPERIUM		
16 observations		
During pregnancy all positive		
Becoming negative in 24 to 72 hours postpartum		
EARLY PREGNANCY		
During first month	18	all positive
4-8 weeks	30	all positive
8-12 weeks	7	all positive
12-20 weeks	6	all positive
EXCEPTIONS		
3 cases 10 to 13 days past period	all	negative
4 to 7 days later becoming	all	positive
PREGNANCY WITH MYOMA		
2½ to 3 months	3 cases	all positive

Another important group of patients studied includes those women who presented certain abnormalities of pregnancy, and from the standpoint of assessing the diagnostic value of this procedure these have proved to be of particular value. Thirty-one observations were made on various types of abortions. In four women, two to three months pregnant, presenting themselves with the symptoms of threatened abortion, the test was positive. In 19 incomplete abortions 10 posi-

tive and 9 negative reactions were obtained. In all those who gave positive reactions, when the uterine cavity was explored, placental tissue was found still attached to the uterine wall, which on microscopic examination was found to be active living tissue, while in those who presented negative reactions, only decidua, or dead inactive placental tissue was obtained when the uterine cavity was explored. In six complete abortions, in which a curettage was performed several days after the abortion had occurred, a negative reaction was obtained in all cases. Microscopic examination of the curettings revealed no fetal tissue.

Two cases of missed abortion are of particular interest and the findings in these two patients may be briefly summarized as follows:

CASE 1.—Was first seen on July 11, 1930, when she was apparently four months pregnant. The ovulation test was positive. She was not seen again until September 30, 1930. At this time, it was found that the uterus had not increased in size, and a clinical diagnosis of missed abortion was made. The ovulation test at this time was found negative. On October 2, 1930, a vaginal hysterotomy was done, and the uterine contents removed. A mummified fetus, together with a completely infarcted placenta was removed. Microscopically it showed no active fetal cells.

CASE 2.—Patient was first seen on December 23, 1930, when she was apparently about three and one-half months pregnant, the ovulation test was positive. On January 9, 1931, she noticed slight bleeding, and ovulation test was negative. She was not seen again until February 27, 1931. At this time there was no bleeding, the uterus had not increased in size, and the ovulation test was again negative. On March 2, 1931, the uterus was emptied, and again a dead ovum with infarcted, inactive placental tissue was obtained.

In contradistinction to these findings, the results obtained in two women, near term, with dead fetuses in utero are of interest. In one instance, the child had died in utero and had been retained for at least a month, and in the other case for a somewhat longer period. The urine from each gave a positive reaction. Both were delivered spontaneously of well developed, but very badly macerated fetuses which had obviously been dead and retained in utero for a long period of time. In each instance, however, the placenta was not macerated, which is the usual finding in such circumstances, and microscopic examination revealed active living fetal tissue.

The results obtained in 6 cases of ectopic pregnancy are also of particular interest. Three gave positive reactions while the other three were negative. All 6 women were operated upon and the diagnosis definitely established. The three whose urine gave positive reactions were of the acute type and at operation active living fetal tissue was found partially attached to the ruptured tube. In the three who gave negative reactions, the symptoms were of much longer duration, and at operation no active fetal tissue was discovered.

One case of hydatid mole was observed. The summary of the observations made on this patient are as follows: A rather large hydatid mole was removed from the

uterus on May 12, 1930. We had just started working on this problem at the time and a specimen of urine was not obtained prior to operation. An ovulation test thirty-six hours after operation showed very large unruptured follicles in the rabbit's ovaries, evidently the result of some ovarian stimulation, but we considered it negative. On June 7, 1930 she returned to the hospital on account of rather free vaginal bleeding at which time a diagnostic curettage was done. The ovulation test was positive, and the microscopic examination showed one or two small hydatid vesicles, with active fetal cells present which were considered not malignant. Forty-eight hours later the test was still positive, but two subsequent examinations gave negative results. On July 17, 1930 she again returned to the hospital on account of some vaginal bleeding. She was again curetted for diagnosis. The ovulation test at this time was negative, and the curettings showed a normal endometrium with no fetal cells to be seen. The subsequent menstrual periods have been quite normal.

The results that we have obtained on these abnormal pregnancies correspond closely to those obtained in similar cases with the Aschheim-Zondek reaction, and by way of interpretation we may quote Aschheim, that "the reaction remains positive as long as living placental tissue is in biologic contact with the maternal blood."

Forty-eight observations were made on women who presented various disturbances of menstruation. Generally speaking, these were carried out as controls though in a number of them it was important to establish or exclude the diagnosis of pregnancy. Twenty-seven of them were women who presented themselves on account of amenorrhea. All were healthy women, the majority of whom had skipped one menstrual period by eight to fourteen days and in whom the possibility of pregnancy existed, while a few were approaching the menopause. All gave negative reactions and all menstruated normally subsequently. In eight other healthy women, who were seen on account of irregular menstruation, the reaction was also negative. It was also negative in thirteen other women, who presented themselves on account of inflammatory lesions in the pelvis associated with irregular bleeding. The symptoms in this latter group were slightly suggestive of ectopic pregnancy. In each instance pregnancy was satisfactorily excluded by subsequent observation or operation.

Eight observations were made on women who were seen on account of persistent, excessive vaginal bleeding. After curettage the uterine mucosa presented the typical picture of endometrial hyperplasia. Seven of them gave negative results, although in two of these unusually large follicles, apparently on the verge of rupture, were seen in the rabbit's ovaries, suggestive of some ovarian stimulation. Repetition of the test, using a larger amount of urine and allowing a longer time to elapse before exploration, gave the same result. In one instance, however, the reaction was definitely positive. This is the only positive reaction that we have obtained in a nonpregnant individual. The patient was a young girl, fifteen years of age, who was admitted on account of rather severe bleeding of puberty. Even this one positive

reaction may possibly be of some significance when we consider the possible relationship between overactivity of the anterior pituitary body and this type of functional bleeding.

In addition to the above, a small series of observations were made on a miscellaneous group of conditions which are tabulated below. All reactions were negative.

REACTIONS IN MISCELLANEOUS CONDITIONS

Normal women not pregnant	5 observations	all negative
Persistent vomiting not pregnant	2 observations	all negative
Advanced carcinoma	5 observations	all negative
(3 carcinoma of ovary, 2 carcinoma of cervix)		
Myoma uteri, not pregnant	3 observations	all negative
Acromegaly, male	1 observation	negative
Hypopituitary, male	1 observation	negative
Froehlich's syndrome (boy)	1 observation	negative
Testicular tumor	1 observation	negative
Dermoid cyst	1 observation	negative
Acute appendicitis	2 observations	all negative
Discarded for lack of subsequent information	5 negative, 6 positive	

SUMMARY AND CONCLUSIONS

The results obtained from the urines of 196 women upon whom the rabbit ovulation test as suggested by Friedman was made are herewith presented. The findings correspond very closely to those reported in the use of the Aschheim-Zondek reaction, with apparently a very small percentage of error. Its advantages over the latter are found chiefly in the much shorter time necessary, its simplicity, and a possible economy of laboratory animals.

From our experience we believe that it should prove to be an extremely valuable and practical method for the early diagnosis of pregnancy. In our series, with the exception of a single case of endometrial hyperplasia, a positive reaction has always indicated the presence of active fetal tissue in biologic contact with the maternal blood stream, or very recently (not over seventy-two hours) separated from it.

A negative reaction does not entirely exclude the possibility of a pregnancy being present, since the intra- or extrauterine ovum may have perished, and been retained for some period of time.

It may prove to be of some value in determining the life or death of the ovum in the early months, though not its immediate death, and not in the later months of pregnancy.

REFERENCES

- Aschheim, S.*: Abhandlungen a. d. Geburtshilfe u Gynäkologie, 1930, Heft 3, s. 1-62, AM. J. OBST. & GYNEC. 19: 335, 1930. *Friedman, M. H.*: Proc. Exp. Biol. & Med. 26: 720, 1929; Am. J. Physiol. 90: 617, 1929. *Friedman and Lapham, M. E.*: AM. J. OBST. & GYNEC. 21: 405, 1931. *Javes, J. J.*: Anat. Rec. 45: 264, 1930. *Schneider, P. F.*: Surg. Gynec. Obst. 52: 56, 1931. *Reinhard, H. L., and Scott, E.*: J. A. M. A. 96: 1565, 1931.



THE CLINICAL IMPORTANCE OF THE SEX HORMONES*

BY E. C. DODDS, M.D., M.V.O., LONDON, ENGLAND

(Courtauld Professor of Biochemistry, Courtauld Institute, Middlesex Hospital)

THE vast amount of knowledge already accumulated on this subject, together with the existence of a number of excellent and full reviews, makes the task of a speaker a very difficult one if he attempts to produce something original for his audience. Again, as the American school of biologists and biochemists was almost entirely responsible for the reawakening of interest in this line of work, one cannot help feeling great diffidence about speaking on such a subject here. The work of Allen and Doisy, Corner and Evans is well known to all and has been reviewed innumerable times, while the work of Zondek and his group in Germany has also received considerable attention. It would appear that little remains to be said upon the subject from a general point of view, and I am, therefore, driven to talk to you about my own work and that which is being carried on in my department by my colleagues. It is felt that the existence of the already mentioned reviews and critiques will absolve the speaker from going over the older and more familiar ground.

THE ESTRUS-PRODUCING HORMONE (ESTRIN OR THELIN)

We have labored almost continuously on this substance since the early publications of Allen and Doisy enabled workers to put their investigations on a quantitative footing with regard to standardization. It is with the latter that I should particularly like to deal. It will be remembered that the unit was defined as that amount of material which when injected subcutaneously into castrated animals was capable of producing estrus. Some workers employed rats, others mice, and the general method adopted was that known as the descending dose technic. In other words, the unit was determined by giving a series of rats, usually a very small number, decreasing quantities of the substance to be assayed, and finding that quantity which would just give the estrous reaction. Practically the whole of the chemical work prior to 1927 depended upon this method of standardization. The results of purification differed very greatly in the various laboratories in America and Europe. Some workers claimed to have produced a unit of very low weight, while others hotly contested this and said that they were unable to confirm these investigations. Some worked with aqueous solutions of the hormone and others with oily preparations, and many workers regarded the water-soluble preparations of their colleagues as

*Read by invitation at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

being completely inactive. As an example of this may be quoted the opinions of Frank¹ in his recent book on the subject. It would appear at first sight impossible to find any explanation for this great divergence of views with regard to the potency of the various preparations, and it is with the elucidation of this problem that I particularly wish to deal. In the first place, it can be conclusively proved that aqueous and oily solutions must be considered entirely separately, and that the same rules for standardization cannot be applied to both. Before going into this in detail, however, it would be advisable to discuss the elements of standardization technic employed in this type of method. Recent research on hormone standardization, and also the standardization of drugs by biologic methods, has emphasized the great importance of the individual variability of the test animals. We are all familiar with the various stages passed through in the production of a uniform

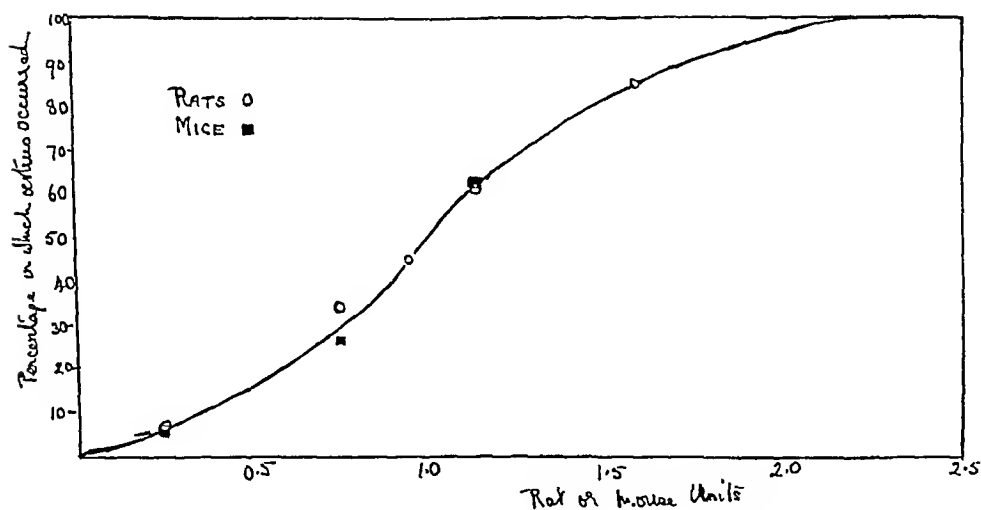


Fig. 1.

—From Coward & Burn.

strength of insulin. In the early days, very few animals were used and it was assumed by most workers that starved rabbits of the same weight reacted quantitatively the same to the same doses of insulin. The error of this supposition was quickly brought home to the investigators, and now the elaborate statistical methods, such as those advocated by the League of Nations Committee, have to be employed. Precisely the same facts govern the standardization of estrin. Undoubtedly the work of Coward and Burn in 1927² was responsible for changing the whole of the outlook on this problem. These workers showed that if a large number of ovariectomized rats, nearly 100, were all given the same quantity of estrin, only a certain number of them reacted. Thus, with the particular dose tried only half of them gave a positive result, and these workers then showed that if more of the substance was given, an increasingly high percentage of animals showed a positive response, and they were thus able to plot out a curve (Fig. 1).

Here it can be seen that a curve of a sigmoid type is produced, and the very fact of the existence of this type of response puts out of court quite definitely the possibility of ever being able to use a descending dose method of standardization. In fact, the employment of this type of method can yield results which will be some hundreds of per cent, inaccurate. As soon as this paper was published the work was repeated in my laboratory, and was definitely confirmed. It became obvious that by this means it was possible to account for some of the grave divergencies between the individual workers. It can be seen from the shape of the curve that the slope is steepest in the region where 50 per cent of the animals showed a positive response, and Coward and Burn proposed a definition of the unit as that amount of material capable of producing estrus in 50 per cent of a series of animals of not less than twenty in number which had all been injected with the same amount of hormone. In our subsequent experiments this type of method was adopted, and it has also been adopted by other workers. Thus Laqueur³ employs a similar method, but makes the unit that amount of material which produces a positive response in 75 per cent of the animals.

While confirming the main points of Coward and Burn's publication, we were not able to concur with two of their conclusions; namely, that the rat and mouse units were the same, and that the distribution of the material in a series of injections does not increase the potency. It is easy to find an explanation for the latter, since the material used by Coward and Burn was a relatively impure oily preparation which was very slowly absorbed. Later work with a highly purified preparation showed that this contention is incorrect. Turning to the type of preparation employed, it will be remembered that it was stated earlier that entirely different rules must be laid down for the standardization of water-soluble preparation. Failure to recognize this fact has led to many misunderstandings. For example, Coward and Burn employed single injections, Allen and Doisy in their original work employed three injections at four-hour intervals during the first twelve hours, and Laqueur used six injections spread over two and a half days. Now it must be remembered that the material prepared by Laqueur is a highly active, water-soluble hormone, but if his or any similar preparation be tested by the method of Coward and Burn, or by that of Allen and Doisy, an entirely negative result will be obtained unless very much greater doses be given than the units referred to by Laqueur. The importance of this fact was borne in upon us in a rather interesting manner. In 1926, attempts were made in my laboratory to prepare an estrus-producing hormone in a water-soluble form. We began with an oily material prepared in a manner similar to that described by Allen and Doisy, and a large bulk of this material was made and standardized and found to be active. Attempts were then made to hydrolyze the product by boiling with alkalis. Owing to the ease with which it

could be removed, barium hydroxide was employed, and a rough description of the method is as follows:

The oily material is boiled with baryta until no more was absorbed, in other words complete saponification was produced by adding successive quantities of baryta. At this stage the precipitate barium soaps and fatty acids were filtered off and the excess of barium hydroxide was precipitated by careful neutralization with sulphuric acid. A clear watery solution resulted which, when injected into animals in a single dose, proved to be completely inactive. At first we attributed this to destruction of activity by the boiling alkalis, and a great deal of work was done in an attempt to produce a preparation free from the associated fats. It appeared from other work which was in progress that the hormone itself was capable of withstanding the treatment already mentioned, and that destruction

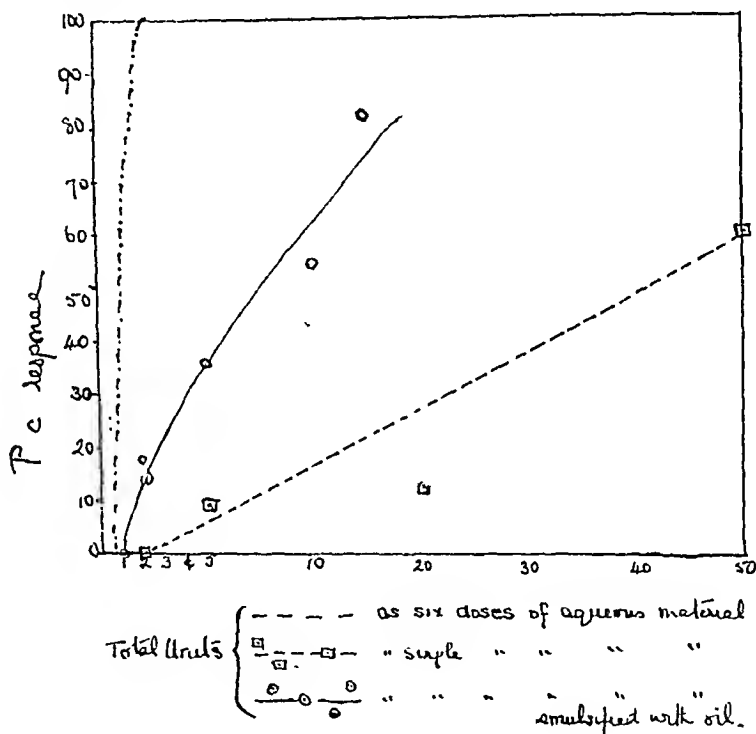


Fig. 2.

could not have occurred, yet we were faced with the fact that when injected the watery solution was inactive. It then occurred to us that perhaps the properties of the water-soluble material were different, as maintained by Laqueur, from a physiologic point of view from those of the oily material. Professor Laqueur, of Amsterdam, very kindly supplied us with some of his material, and on testing it by his method we were able to confirm the activity published by him. On the other hand, if this highly active solution were injected in one dose in the manner employed by us and others for the standardization of the oily materials, then a negative response was given. A repetition of this experiment with our own material produced identical results; namely, that it was inactive when given in one dose, but highly active when given by some method of divided doses, such as that described by Laqueur.

Here, then, lies a second difficulty in standardization. At first sight it is very difficult to explain these results, but it would appear reason-

able to account for them by postulating a very rapid excretion of the highly purified water-soluble material. When given in one dose this would produce no effect, owing to its rapid elimination, but when given in, say, six injections spread over three days, a summation of the stimuli would result and the material would appear to be highly active. There can be no doubt about the truth of these observations since in addition to the early work in Laqueur's laboratory and later in my own, it has been confirmed by Marrian and Parkes, and others. Any method for an accurate standardization must, therefore, concern itself first with the number of animals used; second, they must all be given the same dose and the results worked out statistically, and third, if the material is water-soluble the dose must be distributed in some particular man-

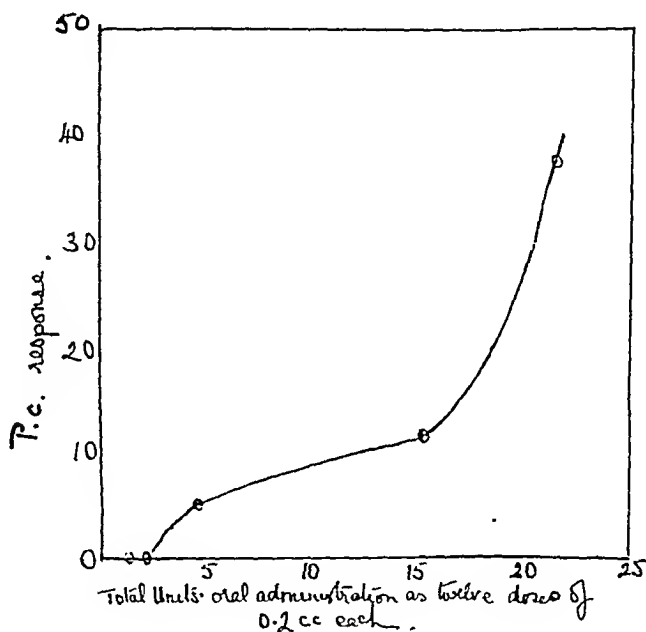


Fig. 3.

ner. It also follows that since an oily and impure solution will produce estrus in a single dose, and a highly purified, water-soluble material will produce estrus only when given in divided doses, there must be some intermediate stage of purity at which intermediate results will be obtained. This is well shown in Fig. 2.

Here can be seen the result of giving the same material first as six doses; second, as a single dose, and third, a single dose of aqueous material emulsified with oil. The six-dose-method produced a very steep curve, while the one emulsified in oil gave a much more sloping one, and the single dose produced the least response of all, indicating that 40 units of this particular material had to be given to produce 50 per cent response. It follows, therefore, that the administration of the hormone plays a very big part in its standardization, and that before the methods of one laboratory can be compared with those of

another a definition of the technic must take place. As pointed out by Laqueur, all these differences can be overcome if an international standard similar to that used in insulin be adopted. It is to be hoped that this will be done in the near future.

Oral Administration.—Most workers maintain that the hormone is inactive when given by mouth, or in any case is so slightly active that the possibility of its administration clinically in this manner can be disregarded. In Germany various relations have been given between the subcutaneous and the oral dose. Thus, some workers maintain that five times the subcutaneous dose will produce estrus when given orally, while others state that several hundred units must be given. It occurred to us that perhaps the same factors governed both oral administration and subcutaneous injection. Thus, it was felt that if a divided dose were given similar to the method advocated for the standardization of the aqueous material, it might be possible to produce estrus with very much smaller amounts than described by some workers. The curve shown in Fig. 3 illustrates this fact.

The material was administered to the animals in 12 doses of 0.2 c.e. each distributed over a period of three days, and it can be seen that the type of curve obtained is similar to that given by the subcutaneous method. By projecting the curve further than we have done, it would appear that about 30 units would be required to produce a response in 50 per cent of animals. It must be remembered, however, that this material was a highly purified water-soluble substance, and that the possibility of employing a cruder material with advantage for oral administration did not occur to us. This is described in a paper by Schoeller, Hohlweg and Dorn,⁶ and they prove conclusively that the purity of the sample bears a direct relationship to the amount which has to be given to produce estrus by mouth. Table I is compiled from their paper.

TABLE I

MOUSE UNITS PER G.	NO. OF UNITS REQUIRED TO PRODUCE ESTRUS IN 50% OF ANIMALS WHEN ADMINISTERED ORALLY
8,000,000 (crystalline)	58
1,000,000	30
200,000	6

With a material containing certain lipoids they claim to produce a substance with which five times the subcutaneous unit will produce estrus in a similar number of animals. I have repeated their experiments, and confirmed their conclusions. It can be seen that all these facts have a distinct bearing on the clinical use of the estrus-producing hormone. On reviewing the lessons gained from the study of animal physiology it would appear that if subcutaneous administration is to be undertaken, the material must be given at frequent intervals in suc-

cessive small quantities. The purer the preparation, then the more frequently will it have to be given to take advantage of the full potency. On the other hand, if administration by mouth is to be undertaken, a cruder preparation containing protective lipoids must be employed.

CLINICAL EXPERIMENTS WITH THE ESTRUS-PRODUCING HORMONE

Before considering the results of administering the hormone to patients it is advisable to consider what results are likely to be anticipated from its use. It is indeed difficult to forecast the action of a substance, such as the estrus-producing hormone, since the biologic significance of menstruation is not agreed upon. It is known that this substance will produce estrus in the ovariectomized animal, but since it is not known to which particular part of menstruation the estrus cycle corresponds, it follows that the action of the hormone will be entirely problematic. Again, one is faced with the quantitative difficulty of how much of the material will have to be administered to women to produce an effect. It will be remembered that Coward and Burn state that the rat and mouse units are the same, but at least for aqueous material this is definitely not the case. Various workers postulate different relationships between the rat and mouse units from equality to 1:20. This discrepancy can doubtless be explained on the grounds discussed before; namely, the variations between watery and oily material, mode of injection, time of smearing, etc. We have been able to compare the rat unit as employed in our laboratory with the mouse unit as employed in Dr. Parkes' laboratory at University College, London. A careful series of crossover experiments showed that the relationship was exactly 1:10. As this is in proportion to the body weight, the rat being roughly 10 times as heavy as the mouse, it would appear that a kilogram basis for calculating the dose would be applicable. Arguing on the same basis, it would appear that 300 rat units would be required to produce a physiologic effect on a woman of average weight. If, however, structural uterine changes are required, then many times more units would have to be employed, for Parkes has shown that to produce uterine changes in the mouse as much as 300 units are required. In view, however, of the fact that the dosage can be spread out by injection, it is possible to get many hundreds of units injected subcutaneously in the course of a few weeks, and it is perhaps reasonable to suppose that by injecting say from 10 to 20 units a day for some prolonged period the result might be obtained. The following is an account of the investigations performed in my department:

The patients were transferred to us from the gynecologic out-patient department, where they had been subjected to a careful pelvic examination, and from our point of view they could best be considered under the following headings:

1. Patients with amenorrhea; these for the sake of convenience may be divided into two classes: the unmarried and the married. These groups correspond roughly to primary and secondary amenorrhea respectively.

2. Patients from whom both ovaries had been removed.

3. Patients in whom attempts were made to induce labor.

4. Patients at the menopause.

In Table II will be found the results of the treatment of all the patients who were injected with the hormone. Every patient to whom the substance was given has been included, so that there can be no question of any attempt at selection. In all, 78 patients with amenorrhea have been injected, and 16 of these were unable for various reasons to continue treatment. The results in these 16 have not been noted, as it was felt that their inclusion would be misleading. We thought it advisable to consider the results under two main headings: first, the direct objective result—namely, the establishment of menstruation—and secondly, the effect of the substance upon the general health and spirits of the patient. While the former is a matter of fact and can be expressed in figures and percentages, the latter is very variable, and indeed, in our opinion, is of little or no value.

TABLE II. AMENORRHEA

	UNMARRIED	MARRIED
Patients treated	40	38
Patients having full two months' course	32	30
Patients in whom menstruation started	10	18
Patients feeling better	30	29

Table II shows that menstruation started in 10 of the 32 unmarried women and in 18 of the 30 married women. In the successful cases the periods usually commenced within a week or ten days after the treatment and consisted first of all of a very slight bleeding, but this amounted to a full period in some. The bleeding was followed after three or four weeks by a full period, described by the patient as perfectly normal. The periods continued for at least six months and these patients all felt a great improvement in their general health. It must be admitted, however, that those women in whom the periods did not appear also felt very much better. A series of experiments was conducted on some of these patients to control the psychologic effect of giving injections, and in many cases excellent effects were observed after normal saline injections when the patients thought they were receiving the active preparation. The general tonic effect appears, therefore, to be largely due to suggestion, possibly associated with the fact that the patient was coming every day to the hospital for treatment.

Patients From Whom Both Ovaries Had Been Removed.—Four patients were treated. From the first, aged twenty-nine years, both

ovaries had been removed on account of cystic disease, and the uterus had been left untouched. The patient was seen five months after operation and had not had any periods. After the standard treatment, menstruation appeared in three weeks, and was followed by another period one month later. In this case the injections were carried on for five months and the periods continued normally. Cessation of treatment, however, was followed by abrupt cessation of the menses. In another patient, aged thirty-two years, the ovaries had been removed three months previously and the patient was suffering from marked menopausal symptoms. The results obtained were similar to those in the first case. The remaining two patients had undergone complete hysterectomy, together with removal of the ovaries, and were suffering mainly from vasomotor symptoms. Their ages were thirty-five and thirty-eight respectively. In the former patient there was a definite leucoplakia vulvae. In both patients the vasomotor symptoms were controlled, and the local condition of the vulva in the first patient was greatly improved by three months' treatment. Unfortunately, sufficient material was not available to continue the treatment or to increase the dose.

Attempts at Producing Premature Labor.—Three patients were treated, and the results are described in detail. It will be seen that in only one was there any evidence that premature delivery had been effected.

CASE 1.—Primigravida, aged twenty-six years, expecting July 15, 1928. Induction for (?) placenta previa, associated with persistent vomiting.

July 7.	12:15 P.M.	Injection 1 c.c. estrin.
	4:15 P.M.	Injection 1 c.c. estrin.
	8:45 P.M.	Injection 2 c.c. estrin.
July 8.	12:15 A.M.	Injection 2 c.c. estrin.
		A few weak pains during night.
	11:00 A.M.	Injection 2.5 c.c. placental extract.
	3:00 P.M.	Injection 5.0 c.c. placental extract.
	7:00 P.M.	Injection 5.0 c.c. placental extract.
July 10.	12:45 P.M.	No pains; general anesthetic; bougie induction.
July 12.	7:00 P.M.	Onset of pains.
July 14.	1:30 P.M.	Normal delivery after a long labor assisted by potassium, bromide and chloral, morphia and scopolamine, and pituitrin when the head was on the perineum.

CASE 2.—Multigravida, aged twenty-five years, expecting September 15, 1928.

July 20.	3:00 P.M.	Injection 5 c.c. estrin.
	7:00 P.M.	Injection 5 c.c. estrin.
	11:25 P.M.	Onset of pains.
	12:00 P.M.	Cervix admitted two fingers.
July 22.	8:00 P.M.	Dilatation 2/6.
July 23.	7:45 A.M.	Dilatation 5/.
	5:15 P.M.	Normal delivery, binovular twins, after morphia and scopolamine.

CASE 3.—Multigravida, aged twenty-two years, expecting May 12, 1928. Induction for (?) postmaturity and disproportion.

July 21.	3:00 P.M.	Injection	5 c.c. estrin.
	7:00 P.M.	Injection	5 c.c. estrin.
	11:00 P.M.	Injection	5 c.c. estrin.
July 22.	3:45 A.M.	Injection	5 c.c. estrin.
	3:30 P.M.	Injection	10 c.c. estrin.
	7:30 P.M.	Injection	10 c.c. estrin.
	10:30 P.M.	Injection	10 c.c. estrin.
July 23.	3:30 A.M.	Injection	10 c.c. estrin.
July 25.	12:30 P.M.	No pains; external cephalic version; bougie induction.	
July 26.	4:50 P.M.	Onset of pains.	
July 28.	5:20 A.M.	Normal delivery.	

We came to the conclusion that very much larger doses of the material would have to be employed before definite results could be expected; and, as at this time we heard that a more elaborate series of experiments was in progress elsewhere, we decided to abandon the investigation.

Administration During Menopause.—A series of five cases was treated by daily injections of 10 units of the hormone, and in all there was a marked improvement. It was found that the extract possessed definite powers of controlling the vasomotor and general symptoms of nervous irritability, but the number of cases was too few to produce anything definite.

Observations made on the possibility of giving the material by mouth open up further research on this subject. A series of patients are being treated by us with an oral preparation of which it is known that five times the subcutaneous unit correspond to one oral unit. At present it is too early to report any definite results, but it would appear that definite action may be obtained by this route.

THE ASCHHEIM-ZONDEK REACTION FOR PREGNANCY

The application of the excretion of sex hormones to the diagnosis of pregnancy has recently been made possible by the work of Aschheim and Zondek. It will be remembered that early in pregnancy estrin and an ovary-stimulating substance are excreted in the urine. The presence of the former is nonspecific and can occur in conditions other than pregnancy, but the latter appears, with very few exceptions, to be specific. The test depends upon injecting the urine, or a detoxicated preparation of it, into immature female mice and noting whether corpora lutea and corpora hemorrhagica (Blutpunkte) are produced. A very high percentage of accuracy is claimed by Aschheim and Zondek in both pregnant and nonpregnant women. The technique has been described in a number of places and hence it is not necessary to say anything about it here. The results obtained in my department are shown in Tables III and IV.

As can be seen, very few mistakes were made and only one specimen from total of 208 gave an incorrect positive response. The patient was a woman forty-six years of age at the menopause who presented no peculiarities. The test was repeated on two different specimens of urine, one of which gave a very feeble positive response in one out of five mice, while the second specimen was negative. A further specimen was obtained and a positive reaction resulted. It is

TABLE III

SPECIMENS	CASES	TEST POSITIVE	TEST NEGATIVE	PER CENT ERROR
Females definitely known—				
(a) to be pregnant	126	122	4	3.2
(b) not to be pregnant	82	1	81	1.2
Males	6	0	6	—

TABLE IV

CONDITION	CASES	TEST POSITIVE	TEST NEGATIVE
<i>Nonpregnant</i>			
Normal female—			
24 hours after delivery	1	1*	0
48 hours after delivery	1	0	1
Lactating	2	0	2
Menstruating	2	0	2
Young girl, 3 months	1	0	1
Young girl, 10 years	1	0	1
Ovarian tumor, benign	2	0	2
After abortion (4 days)	1	0	1
Menopause	5	1*	4
Various gynecologic conditions	5	0	5
Extreme obesity	1	0	1
Menorrhagia	1	0	1
Pituitary tumor	4	0	4
Fibroid of uterus	1	0	1
Total	28	2	26
<i>Pregnant</i>			
Normal female 1½ hour before delivery	1	1	0
Pulmonary tubercle and pregnancy	1	1	—
Total	2	2	—

*Weak.

difficult to understand the explanation of this, as all other patients at the menopause gave no evidence of a positive reaction. As Fluhmann has shown, castration results in an increase in the amount of anterior pituitary hormone in the patient's blood, and it may be that the cessation of ovarian function at the menopause caused a like phenomenon in this patient.

Out of 126 pregnant women only 4 showed negative tests. One of these miscarried three weeks after the test, but the remaining 3 went to term in the ordinary way. The specimens were nontoxic and, in so far as is known, nothing abnormal occurred in the course of the reaction.

With regard to the date at which the reaction first becomes positive, it is stated by most workers that this occurs at the fifth week. The earliest case in our experience was one in which the reaction was positive when the expected period was only nine days overdue.

It is also interesting to note the very rapid disappearance of the hormone from the urine after delivery. Thus, within forty-eight hours, as shown in Table IV, a negative response was obtained. Care was taken to exclude other possibilities, such as the onset and cessation of menstruation and the early months of puberty in which, presumably, there is a large amount of the hormone present in the body. No positive reactions were found.

Attempts have been made to apply this test to the study of disorders of the internal secreting glands. Thus, a number of patients with tumors of the pituitary gland have been investigated. In all of these the diagnosis was confirmed first by x-rays and then by exploratory operation. Up to the present time four such cases have been examined and in none was the reaction positive.

It would appear, therefore, that the test is very specific indeed. At present it is used as a routine in the department, and the gynecologic department requests a large number of tests per week for both in- and out-patients. We also find that the reaction is very useful in the general medical and surgical wards. Great care is required in the organization to have a series of mice of the right age growing up in successive weekly batches so that the tests are never held up.

CONCLUSIONS

In conclusion it would appear that a study of the physiology of the sex hormones offers one of the most promising fields in combined clinical and academic research. Out of the purely academic work has evolved a reaction of such practical value as the Aschheim-Zondek test for pregnancy. New preparations are constantly being obtained; as, for example, the work of Corner in relation to the corpus luteum or progestational hormone and, finally, the various fractions obtained from the anterior lobe of the pituitary. The clinical possibilities of these substances are very great indeed, and it will be interesting to watch their future developments.

REFERENCES

- (1) *Frank, Robert T.*: The Female Sex Hormone; Balliere, Tindall and Cox, London, 1930. (2) *Coward and Burn*: J. Physiol. 63: 3, 1927. (3) *Laqueur, et al*: Versl. d. k. Akad. v. Wetensch. Amsterdam 28: 890, 1925. (4) *Dodds*: Lancet. 1: 1107, June 2, 1928. (5) *Dodds, E. C., Allan, H., Dickens, F., and Howitt, F.*: Biochem. J. 22: 1526, 1928. (6) *Schoeller, W., Dohrn, M., and Hohlweg, W.*: M. J. & Rec. 132: 487, 1930.

THE MORPHOLOGY OF MENSTRUAL BLOOD AND ITS DIAGNOSTIC VALUE*

BY SAMUEL H. GEIST, M.D., NEW YORK CITY, N. Y.

(From the Pathological Laboratories and the Gynecological Service of the Mount Sinai Hospital)

IN PREVIOUS papers published in 1929, it was noted that the normal menstrual discharge contained definite morphologic elements. The recognition of these elements enables us to identify the fluid containing them as menstrual blood, thus differentiating it from other hemorrhagic vaginal discharges.

It had been pointed out by other investigators that uterine mucosa could be found in the menstrual discharge. This fact was utilized to substantiate the contention that there was a desquamation of the uterine mucosa during menstruation, but these findings were not employed as a means of identifying a given hemorrhagic discharge as menstrual.

Clinically it is of extreme importance to differentiate conditions associated with bleeding from the genital tract. Previous to the above-mentioned papers published in 1929, there was no definite method available to make this differentiation other than by the gross appearance or the nonclotting characteristic of the menstrual blood. These criteria, however, were so variable that as an accurate method of differentiation they were not of very great assistance.

Our previously published series of 200 cases has been more than doubled and the findings in this larger series corroborate the earlier published results.

In the menstrual blood (Table I) there is a definite variation in the quantitative content of uterine epithelium. It is found in most marked profusion on the second day of the period. On the first and third days the percentage of positive findings is not so high, while on subsequent days mucosa is only occasionally present.

TABLE I. SHOWING PERCENTAGE VARIATION OF UTERINE VAGINAL ELEMENTS ON
SUCCESSIVE MENSTRUAL DAYS

	FIRST DAY PER CENT	SECOND DAY PER CENT	THIRD DAY PER CENT	FOURTH DAY PER CENT
Uterine epithelium	50	74	25	3
Uterine stroma	75	90	91	4
Vaginal spindles	95	95	82	100
Vaginal plaques	50	72	55	25

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society Hot Springs, Va., May 18-20, 1931.

Apparently the desquamation of the uterine epithelium begins just before the appearance of the menstrual bleeding and in spite of the fact that fragments of mucosa are found in only about 50 per cent of the cases on the first day, undoubtedly they are present in all specimens. This discrepancy may be due, in the first place, to the scanty amount actually present on the first day, and in the second place, to the limited quantity of material available for examination. If the entire menstrual discharge for the first twenty-four hours were subjected to histologic examination, undoubtedly mucosal fragments could be identified in every case. On the second day a percentage rise occurs, probably due to the fact that the desquamation is more extensive and the fragments more readily encountered. On the third

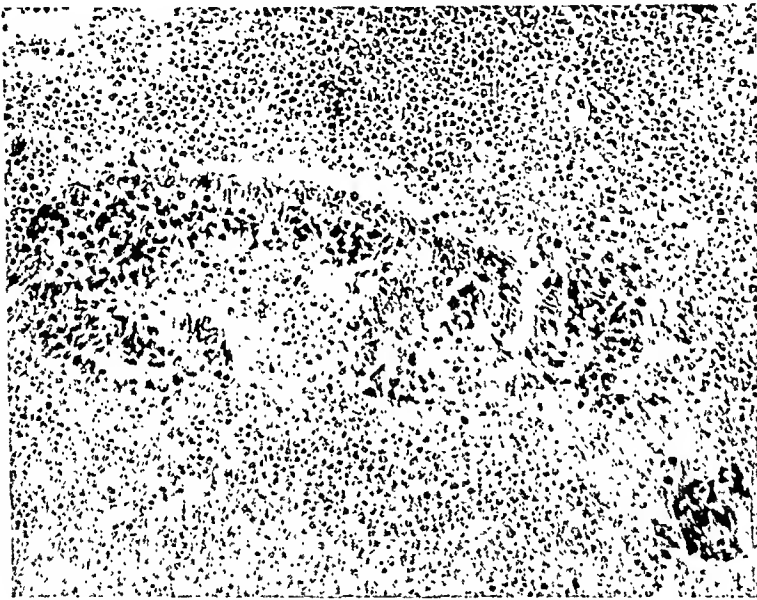


Fig. 1.—Strip of surface epithelium with a small amount of underlying stroma and a small stromal clump in the right lower corner. Sufficient to warrant the diagnosis of menstrual blood.

day the peak of the desquamation has apparently been passed and consistently the percentage of positive findings begins to drop.

As mentioned before on days subsequent to the third, only occasionally is epithelium identified, this in all likelihood being due to the initiation of the reparative process at this time and the absence of further desquamation. In addition, the flow of blood on the previous days has already washed loose and carried out all the previously desquamated epithelial fragments.

In Fig. 1 is illustrated a type of mucosal fragments not uncommonly encountered, representing a strip of surface epithelium with a small amount of underlying stroma. At other times larger fragments of mucosa containing glands and stroma could be identified. (Fig. 2.)

The nuclei show pyknosis, the glandular and surface epithelium is collapsed and compressed and evidences a lack of secretory activity. Occasionally large plaques of mucosa with well preserved epithelium

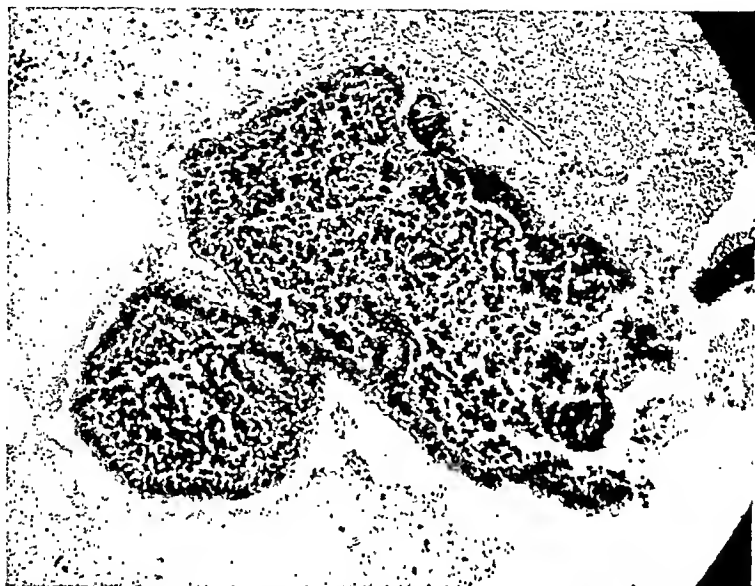


Fig. 2.—Large fragment of mucosa showing epithelium and glands with marked pyknosis of the nuclei. Sufficient to warrant the diagnosis of menstrual blood.

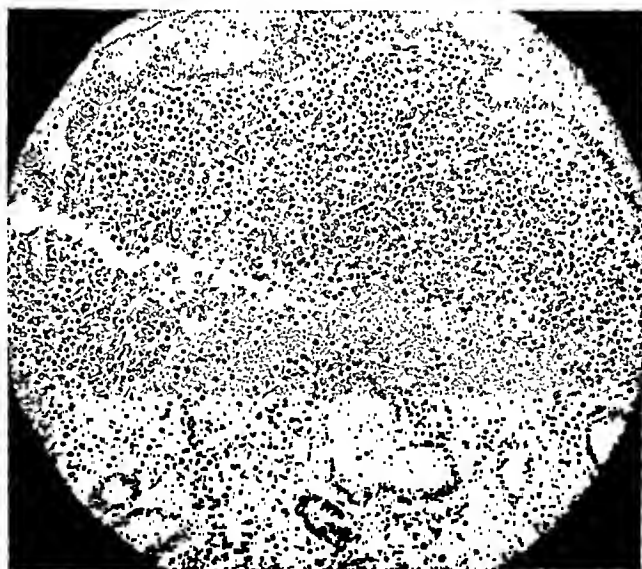


Fig. 3.—Large plaque of mucosa with well preserved epithelium both on the surface and in the glands showing decidual like reaction in the stroma.

both on the surface and in the glands, and containing stroma with a decidual like reaction have been encountered. (Fig. 3.) This tissue resembles fragments extruded in cases of membranous dysmenorrhea. In many instances material comparable to that described has been

found without the associated pain of dysmenorrhea. It might too be of interest to point out that in these fragments there is evidence of secretory activity and further study and investigation of this phenomenon might possibly aid in adding to our knowledge of the etiology of dysmenorrhea.

Stroma cells were found even more frequently than epithelial fragments and often independent of them. The extrusion of stromal fragments also showed time variations. They were more commonly found on the second and third days of the period. As a matter of fact on the second day they were found in 90 per cent of the cases and on the third day in 91 per cent. This high incident of positive findings



Fig. 4.—Several small stromal clumps of well preserved cells. Sufficient to warrant the identification of the fluid as menstrual blood.

was followed by a very sharp drop on the fourth day. These stromal fragments presented a definite entity in the menstrual blood though in some instances only one or two tiny clumps could be found in each slide. These clumps, when present, are sufficiently characteristic to warrant the identification of the fluid in each they were contained as menstrual blood.

In Fig. 4 we can identify several small clumps of stroma composed of well preserved cells, which finding is sufficient to warrant the identification of the medium in which they were contained as menstrual blood. These stroma clumps occur as small groups of darkly stained cells, sometimes very few in number, occasionally in masses of twenty or thirty cells. The nuclei at times appear normal and at other times show pyknosis or other evidences of degeneration. (Chart 1.)

In a small percentage (9 per cent) of cases neither uterine epithelium nor stroma were found. This discrepancy might be accounted for by the fact that not sufficient material was examined or that in certain individuals desquamation of uterine epithelium does not occur. This latter condition has been shown by Heape and Corner to take place in the monkey.

In addition to the presence of uterine epithelium and stroma, vaginal epithelium is found in practically every specimen of menstrual blood examined.

It occurs either as individual cells (Chart 2), few in number or in great profusion, or as vaginal plaques of varying types made up of cell

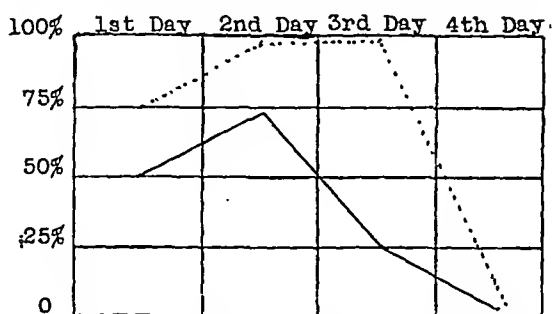


Chart 1.—Graph showing percentage variations in uterine and stromal elements in menstrual blood on successive days. Dotted line represents stroma. Solid line represents epithelium.

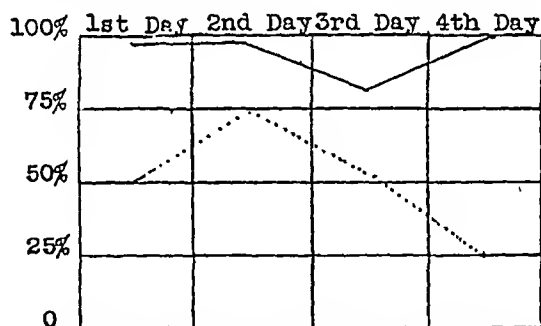


Chart 2.—Graph showing variation in occurrence of vaginal mucosa in menstrual blood. Dotted line represents vaginal spindles.

masses of one hundred or more cells arranged in layers. In association with the other morphologic elements, the presence of these vaginal elements makes the diagnosis of menstrual blood as distinguished from other hemorrhagic fluids more definite. This desquamation adds additional confirmation to the contention of Dieck and others that in the vaginal mucosa a cyclical destruction and repair takes place in keeping with the ovarian and uterine cycle. Figs. 5, 6, 7, and 8 illustrate the varying types of vaginal desquamation encountered in the menstrual blood.

We have studied a large number of cases with irregular vaginal bleeding clinically nonmenstrual in type. They constituted various

types of gynecologic cases associated with fundal bleeding. In about 10 per cent of the specimens examined uterine epithelium or stroma or both were present. However, closer study of the histories of the cases with positive findings made it apparent that we were dealing

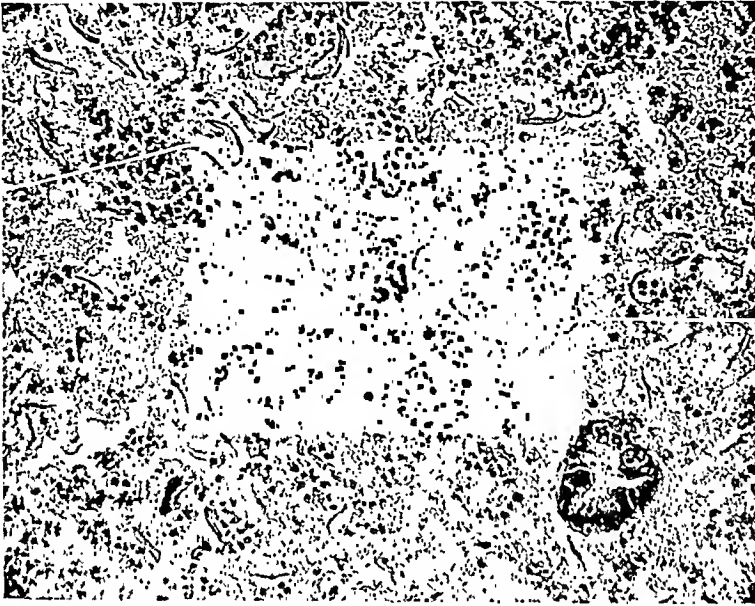


Fig. 5.—Mass of isolated spindle cells derived from the vagina in addition to one small uterine gland.



Fig. 6.—A large fragment of vaginal mucosa. Such large masses are not common findings.

in all probability with menstrual blood in these instances. For example in one case the history suggested the possibility of an ectopic pregnancy, but an exploratory curettage done one day after the vaginal blood was obtained for examination, showed uterine mucosa in

the normal menstrual phase. In two other cases the bleeding occurred approximately one month after a miscarriage. One may be justified in interpreting such an episode of bleeding as menstrual. It is not necessary to go into the details of the other seven histories, but in

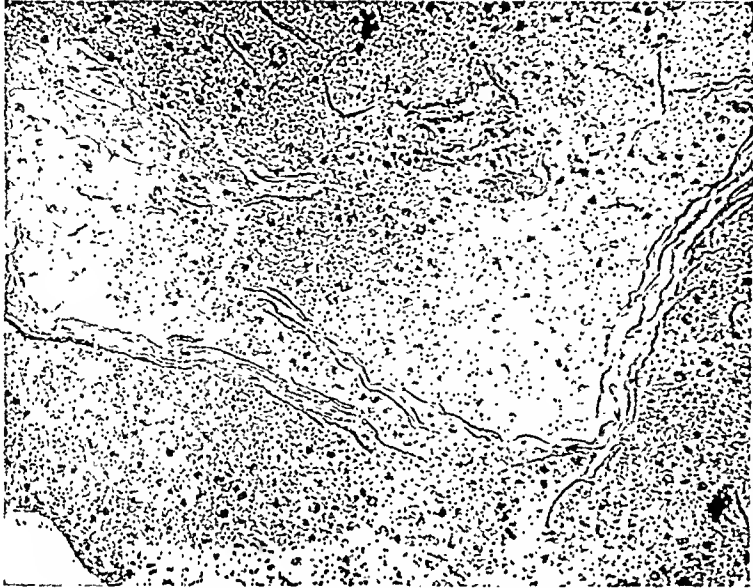


Fig. 7.—Strips of cornified epithelium with numerous isolated and vaginal spindles.

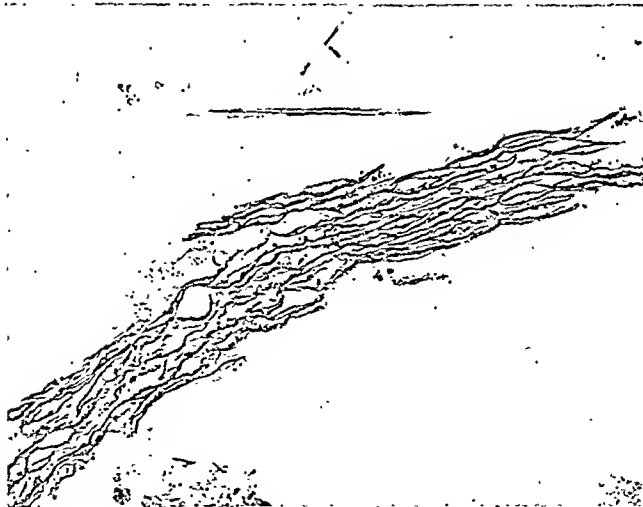


Fig. 8.—Vaginal plaques representing the most superficial layers of the vagina.

each instance sufficient evidence was obtained to make us believe that the cases presenting uterine elements in the blood were probably menstrual.

It happens not infrequently that we are confronted with a clinical case associated with bleeding, the nature of the bleeding being diffi-

cult to determine. The proper interpretation of the type or the etiology of the hemorrhagic discharge will facilitate an accurate diagnosis. By subjecting such cases associated with a hemorrhagic vaginal discharge to an examination, as above described, we were able, in many instances, to aid ourselves in the clinical differentiation.



Fig. 9.—Mucosal desquamation. Uterine mucosa typical of menstruation from a case of suspected tubal pregnancy.

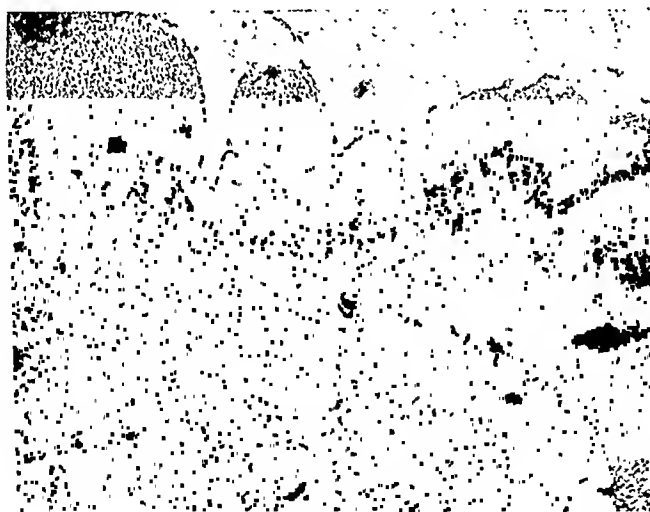


Fig. 10.—Fragment of decidua found in vaginal blood in a case of tubal pregnancy.

In several instances where an ectopic pregnancy was suspected the finding of typical menstrual fragments (Fig. 9) made it evident that we were dealing with a delayed period, associated with some abdominal condition giving rise to right or left side pain, and not with an ectopic pregnancy. It is understandable that one might expect to find in the hemorrhagic discharge associated with an ectopic preg-

nancy, fragments of decidua which represent the disintegration of the uterine mucosa. However, our experience has resulted in the failure to identify tissue that could be confused with the typical uterine desquamation of menstruation.

In another patient in whom an ectopic pregnancy was suspected, the hemorrhagic vaginal discharge contained fragments of typical decidual tissue (Fig. 10). This tissue was in no way to be confused with the uterine desquamation characteristic of menstruation. The only possible confusion would be with a case of membranous dysmenorrhea which clinically in this instance could be excluded. The differentiation from pregnancy could be made because of the absence of typical pregnancy glands, and we therefore felt that the diagnosis of an ectopic pregnancy was justified. The diagnosis was confirmed by laparotomy.



Fig. 11.—Tissue obtained from a case of incomplete abortion showing typical chorionic villi.

Another case of interest was one where the diagnosis between an abortion and an ectopic pregnancy could not be determined. Examination of the vaginal blood showed the presence of two well preserved chorionic villi (Fig. 11) which, of course, immediately established the diagnosis.

In three instances of prolonged secondary amenorrhea, in one case of three years' duration the onset of bleeding was the cause of great concern to the patient and it was important if possible to determine the nature of the bleeding. In these cases the vaginal discharge contained uterine mucosal desquamation such as is found in normal menstrual blood (Fig. 12). This finding established the fact that we were dealing with a typical menstrual period after a prolonged amenorrhea. In another instance of secondary amenorrhea of two years' duration

there occurred a moderate vaginal bleeding after six injections of Theelin. In the vaginal hemorrhagic discharge uterine mucosal fragments were present (Fig. 13) identifying the discharge as menstrual. We cannot, however, ascribe to the administration of Theelin the pri-



Fig. 12.—Typical fragment of uterine mucosa sufficient for the diagnosis of menstrual blood.



Fig. 13.—Typical fragments of uterine mucosa sufficient for the diagnosis of menstrual blood.

mary rôle but we have established a method of determining whether the hemorrhagic discharge following medication, after a period of amenorrhea, is menstrual or not.

In some instances of fibroids associated with polymenorrhea it was possible to show that many of the episodes of bleeding were not due

to the pressure of the tumor or an erosion of the uterine mucosa but to a regular menstrual period in the course of the bleeding associated with fibroids.

It is interesting to note that in cases of functional bleeding both at puberty and in more mature women uterine epithelium is found in the hemorrhagic discharge only occasionally. Of course, it might be present in the very first few days but in these instances where material was obtained at the beginning of a known metrorrhagia we were unable to find mucosal fragments. This leads to the possible assumption that the bleeding associated with these functional cases is not accompanied by a desquamation of the mucosa and probably has a mechanism that differs from that of the normal menstrual flow. Of course, during the menstrual period in the course of a functional metrorrhagia mucosal elements might be present.

To conclude then we can state that we have at hand a means of identifying the true menstrual discharge in about 90 per cent of the cases and at the same time a method that will frequently aid in the differentiation between menstrual bleeding and other types of hemorrhagic vaginal discharge.

100 EAST SEVENTY-FOURTH STREET.

Pratt and Smeltzer: Nasal Spray Method of Administering Hormones of the Ovary and Pituitary Gland. *Endocrinology* 13: 320, 1929.

After experimenting with rats and mice, Pratt and Smeltzer decided that the nasal mucous membrane could be used satisfactorily for the absorption of extracts of the ovary and pituitary gland. Estrus was produced in spayed rats when the nasal cavity was sprayed with ovarian hormone. It required twice the amount used in the nose to produce estrus if the solution was applied to the vaginal mucosa. Several case reports are cited by the authors to show the efficiency of the method in woman. Results were obtained with both ovarian and pituitary extracts. Irritation of the nasal mucosa was not produced but coryza and other local abnormalities are contraindications.

W. KERWIN.

Ford, F. A.: Treatment by Roentgen Rays in Ovarian Dysfunction. *Minn. Med.* 13: 186, 1930.

In discussing irradiation of pituitary and ovaries in amenorrhea, oligmenorrhea, menorrhagia, metrorrhagia, and dysmenorrhea, 6 cases are presented in which there was improvement or cure following treatment. Such results, however, can be obtained in only 50 per cent of cases.

FRANK SPIELMAN.

RERADIATIONS IN THE RADIUM THERAPY OF CARCINOMA OF THE CERVIX UTERI*

BY GEORGE GRAY WARD, M.D., F.A.C.S., AND LILIAN K. P. FARRAR, A.B., M.D., F.A.C.S., NEW YORK, N. Y.

(From the Woman's Hospital)

THE effect produced by the action of radium upon malignant or normal cells should be known to all who use this element. Radium does not remove a cancerous growth by destruction of the entire part affected, as is accomplished by surgery or cautery, but the gamma rays have a direct selective action on the cancer cells, destroying them without injuring the normal cells around the site of the neoplasm. This is often demonstrated in healed cases of carcinoma of the cervix where the normal shape of that organ may be restored with no trace of the cancerous growth.

Another action of radium is to induce a proliferation of connective tissue. The connective tissue contracts with the resulting obliteration in great degree of the blood and lymph supply, producing the contracted, pale-looking cervix and funnel-shaped vaginal vault, that we see in the ideally healed cases.

Therefore we must appreciate that, if the dosage suitable for a certain case is used, we will destroy the cancer cells but not the normal tissues, owing to the selective action of the gamma rays on the carcinoma, and the greater resistance or toleration of the normal tissues.

It must be borne in mind, then, that if we give much larger doses of radium than are required to destroy the cancer cells, we shall also destroy the normal structures beyond repair and produce extensive necrosis with resulting septic absorption, hemorrhages, and injury of adjacent viscera, with perhaps the formation of fistulas.

These unfortunate results of overradiation with this powerful element are commonly attributed to the extension of the carcinoma, or frequently the action of the radium is blamed and consequently condemned as of no value. We must also see that if too small an amount of radium is used, or for too short a time, we may fail to destroy all the cancerous tissue.

The radiologist then must work between the two extremes of radiosensitivity of the cancer cells, on the one hand, and the normal tissues which are the seat of the disease, on the other. If he oversteps these bounds he produces either a so-called "primary acute radionecrosis" or does not cure the condition, owing to a failure to destroy all the neoplastic tissue.

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

Regaud, Nogier, Delbet, Moequot, Herrenschmidt, and others have stated that if cancer cells are subjected to insufficient radiation to destroy them, these tissues become radioresistant and this resistance increases with subsequent, repeated, and prolonged treatments until the tissues become immune to the radium. The normal tissues also become sensitized.

Applications of radium that are prolonged, or repeated at too short intervals, may produce the so-called "late reaction" of radium which is not manifest for six months, or a year or more, following the initial treatment. Dense infiltration and pelvic pain with ulceration and discharge may develop, and it is apt to be attributed to a recurrence of the disease, when actually it is the result of overirradiation of the tissues with resulting excess of connective tissue formation which produces a slowly developing obliterating arteritis. These devitalized structures ulcerate and become a ready prey to infection.

Therefore, it is not generally regarded as sound technique by most authorities to expose carcinomatous tissue to repeated radiations over long periods of time.

Schmitz states that following the initial treatment "should healing of the cancer not ensue, it is not advisable to retreat the patient" and says "he has never seen any benefit from such retreatment and on the contrary the tissues will not recover from the added damage. They become indurated and break down. Such radiation induration and ulcers form very slowly and rarely appear and cause symptoms before the expiration of a year or more."

Lacassagne says that this immunity to radiation on the part of the neoplastic tissue offers an explanation of the fact that epitheliomata of the cervix, which have recurred after radiotherapy, can rarely be cured. Their experience is only 4 cures out of 73 patients who had been previously radiated, or 5 per cent. Norris has expressed similar views.

In accordance with this view which generally prevails, the technique usually in vogue is to complete the treatment in a relatively short period of time, and should recurrences appear, to regard further radiotherapy as harmful and useless.

According to Lane-Clayton's report, the percentages of recurrences at different periods after treatment were 47.5 per cent during the first year, 36.2 per cent the second year, 11.8 per cent in the third year, and 4.5 per cent in the third to fifth year period. If nothing further is done in the way of treatment, 42.5 per cent of recurrences after the first year would be hopelessly lost.

In our clinic at the Woman's Hospital since 1920, we have followed a systematized method which we have previously published, the essentials being to build up the patient's resistance when indicated, by a blood transfusion, and the employment of a test dose of radium varying from 2,400 to 3,600 milligram hours. Occasionally, we have used as much as 4,200 milligram hours, depending on the size of the neoplasm.

We, then, two to three months later, carefully estimate the result. Subsequent radiations and the dosage are dependent on the reaction obtained with the test dose. A personal monthly follow-up is carried out throughout the five-year period of observation as far as it is possible to do so, and whenever we have discovered signs of a beginning recurrence that is within reach, we have not hesitated to employ reradiation at any time throughout the five-year period of observation.

The outstanding feature of our method is this reradiation whenever our monthly follow-up inspection reveals evidence of metastases in the vaginal tract. Nearly 30 per cent of our cases have had repeated radiations.

This is of interest because it is not the usual practice, on account of fear of the radioresistance of the tissues being increased by overradiation and the resulting late radium necrosis. This danger in our belief occurs only if prolonged applications of a heavy dosage are used, and at too frequent intervals. This we try to avoid. Our employment of reradiation is largely for metastatic outbreaks in the vaginal walls or fornices, and consists of a relatively small dosage, usually in the form of platinum needles containing 12 to 13 milligrams of element, although should the nature of the recurrence make the use of a contact-application more desirable, we do not hesitate to use tubes or flat containers. The average dose ranges from 300 to 1,200 milligram hours, depending on the size and location of the metastases.

Very few clinics have so frequent a follow-up, continued throughout the five years, and it is to this that we attribute our success in saving some cases by discovering recurrences long before the patient would be aware of any suspicious symptoms.

We have many instances of successful radiation of such metastases occurring two, three, and four years or longer after the initial treatment—our cure rate for 170 of these cases being 26.5 per cent. We are encouraged to continue this practice in spite of some criticism, as our results would seem to justify it, and as several authorities have recently reported the use of this procedure.

Heyman, in an address before the Royal Society of Medicine in 1929, states that, "we have in recent years, in cases of persistent small residua and in the cases of smaller vaginal recurrences, made use of intubation of radium needles." The Marie Curie Hospital of London reports that they give repeated radiations in certain cases with improvement. Taussig, in a discussion before the American Gynecological Society last year, spoke of the value of reradiation, stating that he had caught recurrences in a very early stage and had been able to save and prolong life thereby.

In this connection it is interesting to note that in the Munich Clinic, the standard treatment is to give a second radiation eight weeks after the first, and if the follow-up shows it necessary, a further treatment is given after a two months' interval. This is reradiation in principle,

according to our viewpoint. Voltz states that no case of theirs survived, that did not receive the second treatment two months after the first.

In an analysis of a series of 147 of our treated cases with both epidermoid and the adenocarcinomatous type of cell, in which we have complete records, reradiations were given in 75 cases at various times during the five-year period, or 51 per cent. Of these 75 radiated patients 18, or 24 per cent, lived five years or longer, and 16 lived from five to ten years. As an example of the value of repeated radiations, one patient with cells of Type II, now living and well seven years and five months after her initial treatment, had five reradiations, the last being twenty-two months ago.

It seems fair to assume that if this group of 75 patients with metastases had been abandoned without further radiation for fear of a late radium reaction, or that an acquired radioresistance would prevent further beneficial result from the radium, they would all have succumbed to the recurrent carcinoma.

The locations of the metastases in 54 patients who received reradiations were as follows:

- 45 in the cervical region
- 5 in the vaginal wall
- 2 in the base of the broad ligaments in the lateral vaginal fornices
- 1 in the vulva
- 1 in both cervix and vaginal wall

TABLE I. SHOWING THE AVERAGE LENGTH OF LIFE AFTER RECEIVING THE LAST RADIATION IN 111 CASES

TYPE OF CELL		STANDARD TEST RADIATION	SUBSEQUENT RERADIATIONS				
			I	II	III	IV	V
Group I	Cases	15	12	5	1		
	Average Life Months	36	17	5.5	4		
	Living 5 Years	6	1				
II	Cases	16	9	3	2		1
	Average Life Months	36	40	32.5	45		25.5
	Living 5 Years	4	2	1	1		1
III	Cases	8	6	2			
	Average Life Months	23	34	8			
	Living 5 Years	1	2				
I-II	Cases	7	4		1		
	Average Life Months	11	40		25		
	Living 5 Years		1				
I-III	Cases	4		1			
	Average Life Months	30		1			
	Living 5 Years						
II-III	Cases	2					
	Average Life Months	5.5					
	Living 5 Years						
Adenocarcinoma	Cases	2	6	3	1		
	Average Life Months	5.5	42	15	12		
	Living 5 Years		3	1	1		

Table I gives the average length of life after receiving the last reradiation in 111 cases, showing the results in relation to the type of cell.

Table II shows the average time of recurrence of carcinoma after various reradiations in a series of 57 cases of the epidermoid type of cell.

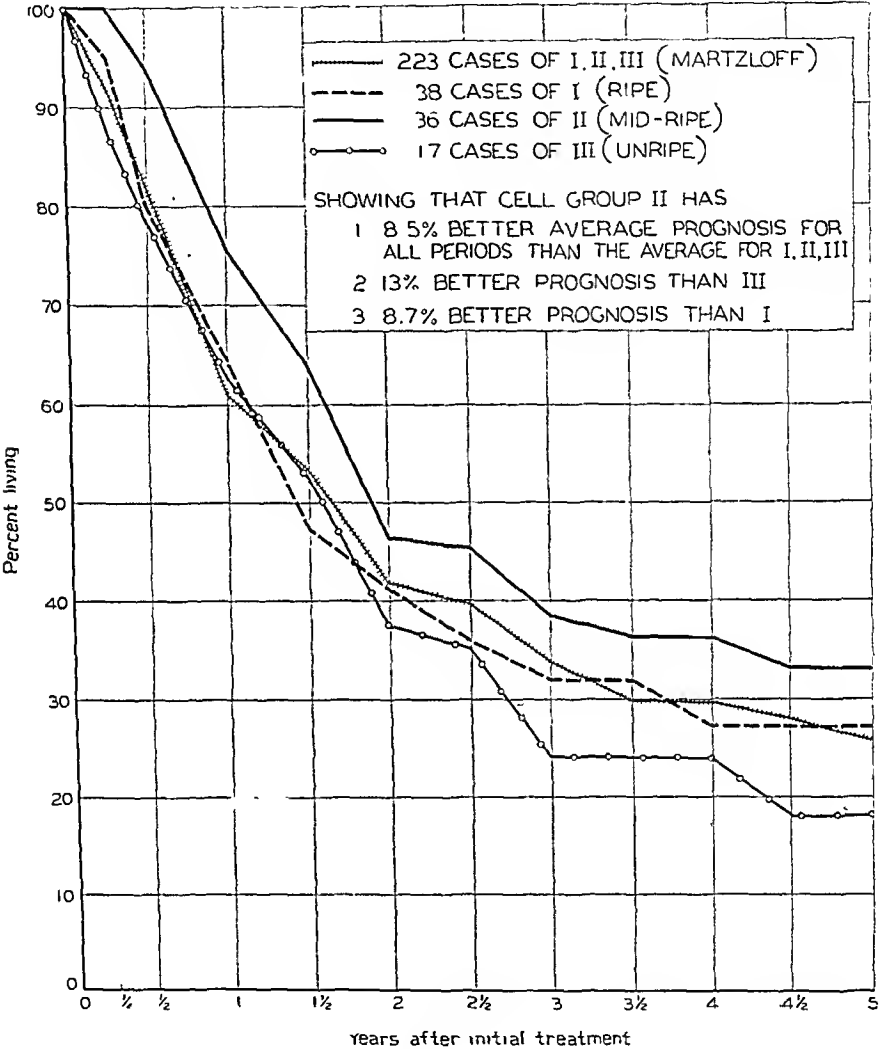


Fig. 1.

TABLE II. AVERAGE TIME OF RECURRENCE OF THE CARCINOMA AFTER THE VARIOUS RERADIATIONS IN 57 CASES, INCLUDING THE SQUAMOUS-CELL CARCINOMA TYPES I, II, III, I-II, I-III, AND II-III

RADIATIONS	AVERAGE TIME BEFORE RECURRENCE OF CARCINOMA IN MONTHS				
	FIRST	SECOND	THIRD	FOURTH	FIFTH
One Reradiation	7.2				
Two Reradiations	11.7	23.0			
Three Reradiations	5.9	11.7	22.6		
Four Reradiations					
Five Reradiations	5.5	13.5	18.0	22	64

The results we have obtained in the various types of cell have been variable, and not always in accordance with the radioresistance of the cell. In a study of the epidermoid cancers we found that cell Group II (midripe) had an 8.5 per cent better average prognosis for all periods than the combined average for Groups I, II, and III, a 13 per cent

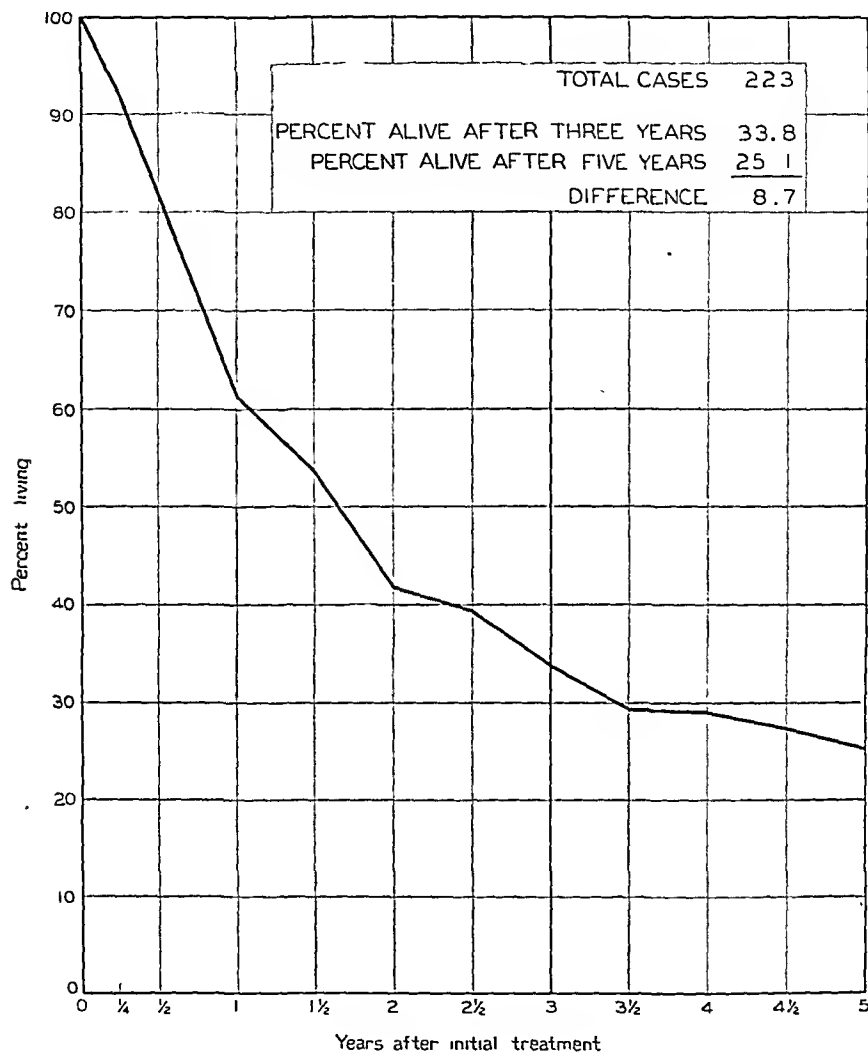


Fig. 2.

better prognosis than Group III (unripe), and an 8.7 per cent better prognosis than Group I (ripe), as shown in Fig. 1.

Adenocarcinoma of the cervix occurred in 20 out of 259 of our series, or a ratio of 1 to 12.95. This type of cell is generally classed as very radioresistant, and Regaud states that he has had very few cures in this type and advises operation. This is somewhat contrary to our experience, as in an analysis of a series of 147 cases with complete records, 13 were adenocarcinoma, with 4, or 30.7 per cent, of the patients living

five years. Of these 13 patients 9 received reradiations with a salvage of 4, and the 4 who were not reradiated did not survive.

Our experience confirms that of other observers that the three-year results are an index of the five-year cures. Fig. 2 shows that of 223 patients 33.8 per cent were alive after three years and 25.1 per cent after five years, the difference being 8.7 per cent. This difference is reduced if we take into account the normal mortality rate for two years at the average age of fifty that may be expected, so that we may judge with a fair degree of accuracy of the value of any line of treatment at the end of the three-year period.

It is apparent that in order to detect metastases in their incipency, a frequent follow-up with a careful examination is essential. In no other way can we have the opportunity of destroying the recurrence while it is yet small and amenable to local treatment. It is useless to depend upon the subjective symptoms, as a recurrence in the vaginal tract will have gained considerable headway before giving rise to discharge, bleeding, or pain. The success of a follow-up clinic largely depends on the surgeon who operated upon the patient personally conducting the examinations. The patient will then come back as directed, but if the examination is left to an assistant, she will soon become delinquent. Furthermore, it is necessary for the surgeon who has studied and treated the original condition to watch the progress and changes that may occur, if a reliable appraisal of the condition of the disease is to be made. We grant that such a frequent personal follow-up is somewhat arduous, but we feel that we have learned much by this close observation of the course of the disease and that the results obtained have compensated us for our time and trouble.

It would not be possible for our cancer follow-up clinic to function satisfactorily if it were not for the valuable aid we receive from the Social Service Department, which cooperates with the Record Department, in tracing delinquent patients. The contact the Social Service makes with the patient while in the hospital is invaluable in educating the patient and her family to appreciate the importance of a strict attendance and the seriousness of neglect. We have been able to have a completed follow-up for five years of 96.4 per cent of our patients.

CONCLUSIONS

Reradiation in treatment of carcinoma of the cervix is of definite value in local metastasis.

Frequent examination at regular intervals should be made by the surgeon who applied the radium, to insure recognition of these recurrences sufficiently early for successful reradiation.

An analysis of 170 cases of epidermoid and adenocarcinoma of the cervix shows that nearly 50 per cent of the patients had more than one

radium treatment, and 26.5 per cent of the patients that were reradiated, lived five years or more.

Adenocarcinoma of the cervix was found in 13 of 147 patients studied. Nine of these 13 patients were reradiated and 4 of the 9 lived five years or longer. *The four patients that were not reradiated, did not survive five years.*

48 EAST FIFTY-SECOND STREET.
380 RIVERSIDE DRIVE.

A FIVE TO FIFTEEN YEAR FOLLOW-UP STUDY OF ONE HUNDRED NINETY-TWO CERVICAL CANCERS*

BY FRANK W. LYNCH, M.D., SAN FRANCISCO, CALIF.

(From the University of California Medical School)

IN 1926, I reported the five-year end-results in the treatment of 107 cancers of the uterine cervix. The study has been continued since then and another group of cases is now ready for review. Because the new series is also small, I am combining my entire material instead of presenting separate reports. This paper, therefore, is based on a study of 192 proved cancers of the uterine cervix treated between March, 1916, and March, 1926, in my series in the University of California Hospital. The five- to fifteen-year end-result is now known in all but 2 patients, each of whom escaped the follow-up after having been seen and examined for more than three years. At the time of the 1926 report, there were 3 cases lost from the follow-up. One of these has been found to be alive and well now ten years after treatment. The efficacy of the follow-up is further attested by the fact that no case has been lost from observation between March, 1921, and the present time.

Material.—The series is comprised of 159 patients who had had no treatment for their cancers prior to admission to my services and 33 women who had had operations for them elsewhere and had been referred to me later for radiation either as prophylaxis or for treatment of an evident recurrence. I have classified my material as follows: Group I, 17 cases; Group II, 26 cases; Group III, 74 cases; Group IV, 42 cases, and Group V, or Recurrent Group, 33 cases.

The grouping of cancer cannot be standardized because so much depends upon the individuality of the surgeon. The cancer of a certain patient may appear to one well-trained surgeon as a definite example of one group, whereas another equally competent man may assign it to an entirely different classification. For this reason there will always be disagreement concerning the proper grouping of any but the very early

*Read at Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

and very late cancers. A basic consideration makes a fair comparison of the result of treatment of any two series a most difficult or even impossible matter.

The proportion of the series that is comprised of Group IV cases assumes much importance when one comes to calculate the relative, or what are now termed absolute, cures in the series, since cures of Group IV cases are not likely. The percentage (26.6 per cent) of Group IV cases in my series is higher than that usually reported. Ward, in 1930, reports that only 4.4 per cent of his patients belonged in Group IV. On the contrary, the percentage of my cases in Groups I and II is high (27 per cent). The period of survival of Group IV cases should serve as an index as to the accuracy of the diagnosis in this group. The survival curve for my 42 patients of Group IV is shown in Fig. 1. Eight of the patients who were inoperable had a vesio- or rectovaginal fistula at the time of first treatment.

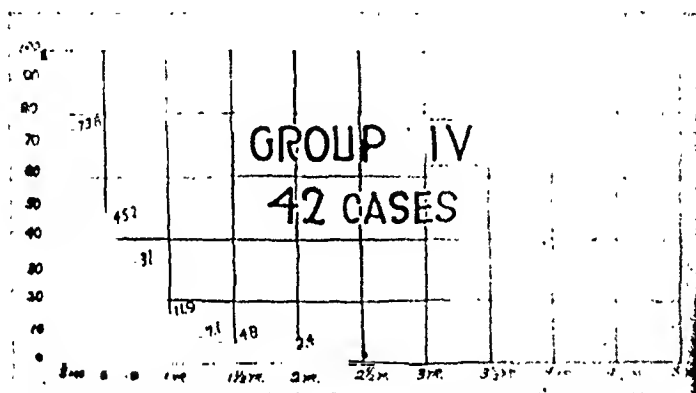


Fig. 1.—Survival curve of the forty-two cases of Group IV showing that three only survive more than one year.

Treatment.—Thirty-one of the patients in Groups I and II were operated upon by a modification of the Ries technic, most of them after preoperative radiation. Some of them also had postoperative radiation. Twelve patients in Groups I and II, comprising the bad surgical risks and the 2 patients who refused operation, were treated only with radium, or rarely also with deep roentgen-ray exposures. The other patients of the series were radiated only, except 3 patients who were inoperable but who were operated upon after the mass disappeared following radiation.

The age grouping is of interest in any cancer series. It has a practical bearing because few cures are expected in women of more than seventy years, since deaths from intercurrent disease during the period of observation at this time of life are far more common than five-year cures. Cancer in the young is also supposed to be more fatal than in women more mature, a point not proved by results in my series. The age grouping and five-year survivors are shown in Table I.

TABLE I. AGE GROUPING

AGES	TOTAL SERIES	FIVE-YEAR SURVIVORS
20-25	1	1
25-29	6	2
30-39	27	4
40-49	63	19
50-59	61	8
60-69	27	3
70-79	6	2
80-89	1	0
	192	39

Family History.—Textbooks usually state that comparatively few patients with cancer know of others in the family who also have had cancer. My experience is quite to the contrary. The more carefully the patient's history is taken, the more certain the student will be to obtain a positive family history of cancer. Especially is this true in patients who know something concerning two generations of their forebears. Table II shows the data obtained from the family history of my patients.

TABLE II. FAMILY HISTORY CARCINOMA
(Series January, 1916 to April, 1926)

Negative	138 (72.0%)
Positive	45 (23.3%)
Strongly suggestive	9 (4.7%)
Positive in 2 members	3
Positive in 3 members	1
Positive also in husband	1
Total	192

Results of Treatment.—The survival curve of the Groups I, II, III and IV cases should permit the visualization of my material. The mortality rate in the first year is due in large part to the deaths of Group IV patients. One year after treatment only 57.2 per cent of the entire series survive; two years after, 39 per cent remain. There is comparatively little mortality between the second and third years, but between the third and fourth years more than one-fourth of those who were alive at the end of three years succumbed to the disease. During the fourth year only approximately 10 per cent of those surviving at the end of the fourth year die from the cancer before the fifth year. More patients died during the first year than in the succeeding four years. The relative five-year cure is 20.8 per cent (Fig. 2).

Group I and Group II Cases.—These patients represent the group ordinarily considered operable from which must come most of the permanent cures of any series. Twenty-seven per cent (43 cases) of my entire series were classified as Group I and Group II cases. Twenty-five patients, or 58.1 per cent, of Group I and Group II cases remain as five-year cures.

The results varied, depending upon the type of treatment, and possibly also with the type of case. There were 31 patients in Groups I and II who had radical operations, with or without preoperative or post-operative radiation. There were 67.8 per cent five-year cures, without deduction for a patient lost after being well for three years, or for a patient who died of intercurrent disease, or for the four who died as a result of the operation.

TABLE III. GROUPS I AND II. RADICAL OPERATION WITH OR WITHOUT PREOPERATIVE OR POSTOPERATIVE RADIUM

Total number of patients	31
Lost, well at 3 years	1
Died of intercurrent disease	1
Died, result of operation	4
Died of cancer	4
Alive and well, 5 to 14½ yr.	20
Cancer death, 6 years	1
Five-year cures; no deductions	67.8%
Operative mortality	12.9%

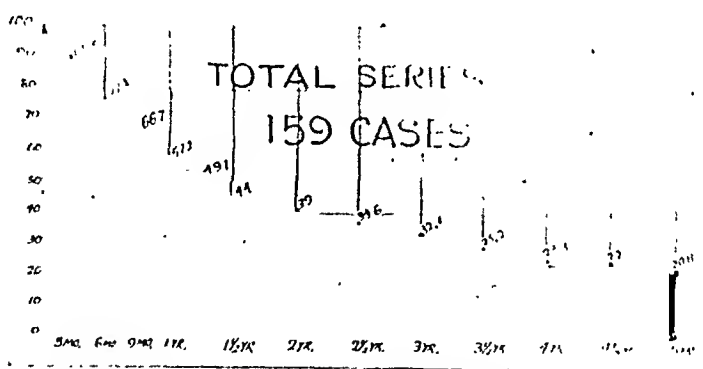


Fig. 2.—Survival curve for five-year study of 159 cervical cancers including all cases of Groups I, II, III and IV.

In contrast, there were 12 patients in Groups I and II who were treated only by radiation, with only 4 five-year survivors, or 25 per cent cure. The Group I patients who were not operated upon but were radiated only, consist of 3 patients, all with early growths, and all survive. One of the women, aged forty years, whose early growth has been cured for five and one-third years by 4,616 me. hours of radium, also developed a cancer of the nose requiring radium treatment, and one year later a malignant papilloma of the bladder. Another patient, a girl of twenty-two, had an early cancer which was not diagnosed until the pathologist found the tumor in tissues removed by a cervical repair. The patient refused further surgery and would not submit to radiation until forty-nine days after this tissue, 2 by 2½ by 1 cm., had been removed from the hypertrophied cervix. Whether the five-year cure resulted from the radiation or from the removal of a sluggish and early carcinoma might be difficult to determine.

TABLE IV. GROUP I. RADIATED, NOT OPERATED

Total number	3
Well, 5 years	3

One patient had a microscopic growth which was found after cervical resection. Radiated 49 days later. Does case belong in this grouping?

There were 9 Group II patients who were not operated upon but were radiated only. This group presents a rather sorry picture, since only 1 of the 9 survives as a five-year cure. The permanency of the only cure seems attested, since eleven years after treatment she seems to be cancer-free. Five of the others seemed cancer-free for three years, yet 4 of them died of cancer before four years had elapsed, and the fifth succumbed at four years, nine months after treatment. The sixth patient died two years after treatment from bowel obstruction of cancerous origin or possibly as a result of radium given when our experience was incomplete. Two others died from intercurrent disease when clinically free from cancer two and three years respectively after treatment. The five-year cure is but 25 per cent.

TABLE V. GROUP II. RADIATED, NOT OPERATED

Total number patients	9
Died within 3½ years	7
Died 4 years, 9 months	1
Died of cancer	6
Died of intercurrent disease	2
Alive, well 11 years	1

Operation refused, 2; contraindicated by heart disease, 2; by diabetes, 1; by poor general condition, 2; by age, 2.

Five-year Cures in Groups I and II, 25 %. No Deduction.

It might be argued that many of these cases were not fair tests for radium, since the entire group represented the bad risk patients who otherwise would have been treated surgically after preliminary radium. That cannot be disproved. Seven of the 12 women were over sixty years of age, 5 were over sixty-five, 1 being seventy-two and another eighty-two. The younger women had heart disease, diabetes, or refused operation.

Others, moreover, might not have grouped these cases as we did. Some of them might have belonged in Group III. I would have operated upon them, however, had conditions favored, since the operability of many of the patients that we did operate upon was at least as doubtful as those just cited above.

The 14 Group I patients who were treated by radical surgery all had early tumors. The largest was only 3 cm. in diameter. Four patients had very early growths, suspected rather than actually diagnosed as cancer before frozen sections were made. That very radical surgery can be safely performed on good risk patients with early tumor is shown

by the absence of surgical mortality or cancer deaths in this group; yet the series must be charged theoretically with 2 cancer deaths. One of these patients was lost after being well more than three years (her mail from us was not returned unclaimed from her postoffice address until more than five years after her first treatment), and one other patient

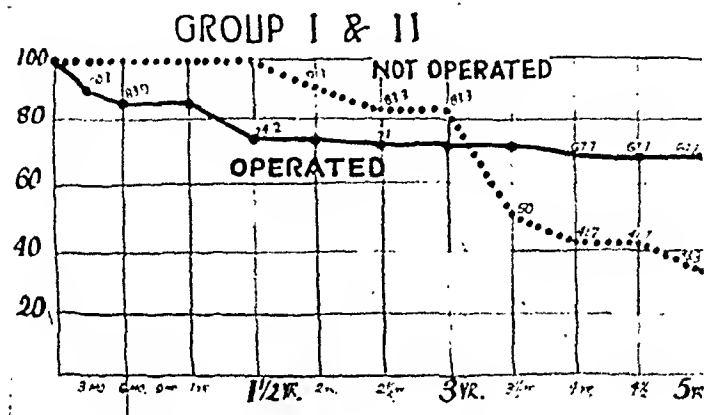


Fig. 3.—Contrasting survival curves of Group I and II cases that were operated upon with or without radiation with those that were not operated upon but were treated only with radium. Note the marked drop in the survival of the nonoperated but radiated patients who have remained well for three years and the comparative freedom from death of the operated cases that survived one and one half years after treatment.

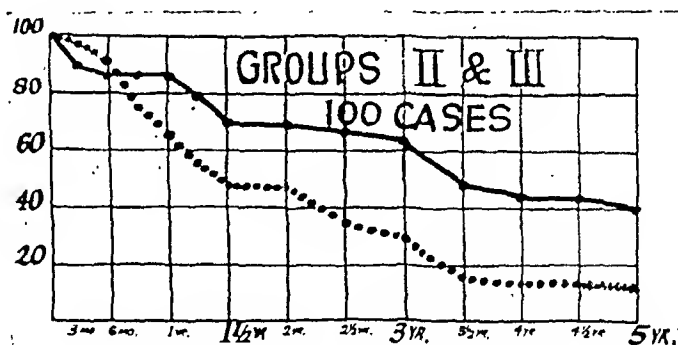


Fig. 4.—Shows survival curve of all Group II cases contrasted with those of Group III.

died of cerebral apoplexy one year after operation, at which time there was no sign of recurrence of cancer. These charges, necessary for proper statistics, reduce the cure to 85.5/7 per cent.

TABLE VI. GROUP I. RADICAL OPERATION ALONE OR WITH PREOPERATIVE OR POST-OPERATIVE RADIUM

Total cases	14
Lost, well 3 years	1
Dead from intercurrent disease	1
Dead from operation	0
Dead from cancer	0
Alive and well, 5 to 15 years	11
Dead from cancer, six years	1
Five-year Cures, 85.5%; No Deductions	
Operative Mortality, 0	

The 17 Group II patients that were operated upon and also radiated need no discussion. Nine of them remained as five-year cures. The mortality resulted early in the series and is attributable to the treatment of patients that really belonged in Group III. In order to check the accuracy of the grouping of II and III patients, we arranged a survival curve (Fig. 4). The differences between the groups is readily appreciable. The result of treatment is shown in Table VII.

TABLE VII. GROUP II. RADICAL OPERATION ALONE, OR WITH PREOPERATIVE OR POSTOPERATIVE TREATMENT

Total number patients	17
Lost	0
Dead from intercurrent disease	0
Dead from operation	4
Died of cancer	5
Died of cancer in 1 year	4
Died of cancer at 3 years	1
Alive and well, 5 to 14½ years	8
Died of pneumonia, cancer-free at 5½ years	1
Five-year Cures, 53%; Operative Mortality 23.5%	

Groups III and IV proved most disappointing, as we continued our follow-up of these patients for many years because so many of them who were cured for five years, later developed either recurrences or else other cancers.

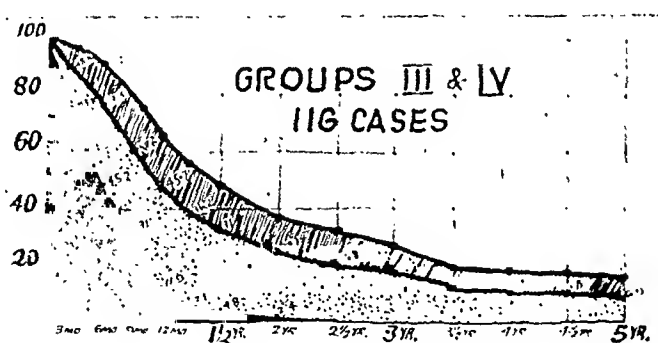


Fig. 5.—Survival curve of one hundred sixteen cases of Groups III and IV showing the hopelessness of the Group IV cases, and how their early demise affects the survival curve of the combined Group III and IV cases. Upper curve is survival curve of Group III cases, middle curve is for the combined Group III and IV cases, and lower curve indicates that for group IV cases.

There were 8 five-year cures (7.1 per cent) in this group, all of which have been followed subsequently. That patients apparently cured of cancer for years tend to die eventually of cancer seems attested by 2 patients who developed late recurrences: one died of intestinal obstruction nearly six years after her first treatment and the other has developed metastasis to the lower spine seven and a half years after radiation. This metastasis has grown very slowly and has not yet killed at the time of this report, more than two years after it first caused symptoms. During this time, the patient has been bedridden and cannot walk because the upper part of the sacrum has been eaten away from the lumbar spine.

Two other patients developed breast cancer, were operated upon and died from chest involvements five and a half and ten and a quarter years respectively after apparent cure of their pelvic cancer. The three who remain well have survived for five years, four months; five years, seven months; and ten years respectively. The known incidence of return of the original cancer after five years' apparent cure is 2 out of the 8 patients (25 per cent.).

Properly included under this heading are 3 Group III patients who were operated upon after the tumor had disappeared following radiation. One of the 3 has survived twelve years. Her uterus, after removal, contained cancer cells which we regarded as dead or dying at the time but which at present we feel we know little about in view of the many late recurrences brought to our notice as the follow-up continues.

TABLE VIII. GROUPS III AND IV. CASES TREATED BY RADIUM ONLY, OR RARELY ALSO WITH DEEP ROENTGEN RAY

Total number of patients	113
Lost, well at 3½ years	1
Died within 3 years	93
Died from 3 to 5 years	11
Five-year cures	8 (7.1%)
Died after five years, one each from	
intestinal obstruction	5½ yr.
Carcinoma lung (metastatic from breast)	5½ yr.
Carcinoma of breast	10¼ yr.
Septic sore throat	5½ yr.
Living, well, 5½, 6 and 10 yr.	3
Living, metastasis to spine 10 yr.	1

TABLE IX. GROUP III. PATIENTS TREATED BY RADIUM AND THEN HYSTERECTOMY SEVERAL MONTHS LATER

Wertheim; died cancer	1½ years
Panhysterectomy; died cancer	4½ years
Incomplete Wertheim; living, well	12 years

Recurrence After Nonradical Operations Elsewhere.—Whatever the future will determine as to the relative values of truly radical surgery and of radium, there is no doubt whatever that the results of radium, even in inoperable cases, far surpass those of ordinary panhysterectomy even in cases deemed at least sufficiently operable to warrant its employment. The time has now arrived when the case has been proved that the ordinary panhysterectomy has no place whatever in the treatment of any but microscopic and, therefore, unrecognized cancers. If this paper which reports my results with radium and a very radical Wertheim type of operation would furnish the faintest reason for warranting others to undertake such a nonradical type of surgery as panhysterectomy I would feel that this entire study would be distinctly not worth while. A series of 26 patients treated by panhysterectomy performed by perfectly competent surgeons furnished no cure for more than four years in spite of my postoperative radiation treatment. Contrast

that with 7.1 per cent of cures in the inoperable cases that had never had other treatment than radiation. While there are some five-year survivors after incomplete operations, such as supravaginal hysterectomies or cervical resections, there is evidence forcing us to believe that these were radiosensitive but slow growing cancers that were not readily excited to growth by the trauma of the incomplete surgery.

TABLE X. RADIUM FOR PROPHYLAXIS OR RADIUM AFTER NONRADICAL OPERATION ELSEWHERE

	HYSTERECTOMY		CERVICAL RESECTION
	PAN.	SUPRAVAG.	
Number patients	26	4	3
Died cancer	26	2	1
Died 2 yr.	23	2	0
Dead between 2 and 3 yr.	1	0	1
Dead between 3 and 4 yr.	2	0	0
Alive and well 5 yr.	0	2	2

SUPRAVAGINALS

1 dead, cancer breast, in 8th year, well 6 years
1 well 9 years, recurrence abd. wall, 6½ years

CERVICAL RESECTION

Both well 10 years, one had cancer of breast
operated upon after 6 years, pelvic cure.

Tables XI and XII show the results of the follow-up when continued for more than five years. It is distressing to note that nearly one fourth

TABLE XI. CONDITION OF FIVE-YEAR SURVIVORS

<i>Dead</i>	
5 yr.	Recurrence breast cancer
5 yr. 4 mo.	Recurrence pelvic cancer
5 yr. 5 mo.	Intestinal obstruction—recurrence?
5 yr. 6 mo.	Septic throat; no recurrence cancer
5 yr. 8 mo.	Pneumonia; cancer-free
8 yr.	Cancer breast
10 yr. 3 mo.	Cancer breast
<i>Living, with cancer</i>	
7 yr. 5 mo.	Pelvic recurrence (6½ yr.)
8 yr. 10 mo.	Pelvic recurrence
9 yr. 10 mo.	Operated 6¼ years for breast cancer
	Now no signs of recurrence
10 yr.	Lumbar vertebrae and sacrum separated by metastases
<i>Living, with advanced pulmonary tuberculosis</i>	
	14 yr., 4 mo.
<i>Well, apparently cancer-free</i>	
5-6 yr.	8
7-8 yr.	3
8-9 yr.	6
9-10 yr.	1
10-11 yr.	2
11-12 yr.	2
12-13 yr.	2
13-14 yr.	2
	26

of the five-year survivors died subsequently from recurrence of their original cancer or developed other cancers of equal importance.

In conclusion, we present our results for all groups.

TABLE XII. FIVE-YEAR CURES

GROUP I	14 patients operated upon and radiated	12 patients, or 85 $\frac{1}{4}$ %, cure
	3 patients radiated	3 patients, or 100.0%, cure
GROUP II	17 patients operated upon and radiated	9 patients, or 53.0%, cure
	9 patients radiated	1 patient, or 11.0%, cure
GROUP III	71 patients radiated	8 patients, or 11.3%, cure
	3 patients radiated and operated upon	1 patient, or 33.0%, cure
GROUP IV	42 patients radiated	0 patient, or 0 %, cure
GROUP V	43 patients radiated	4 patients, or 12.1%, cure
Total	192 patients	38 19.3% cure

CONCLUSIONS FROM A STUDY OF FIVE-YEAR CURES IN A SERIES OF 121 CASES OF CARCINOMA OF THE CERVIX UTERI*

By H. S. CROSSEN, M.D., ST. LOUIS, MO.

(From the Department of Obstetrics and Gynecology, Washington University School of Medicine and Barnes Hospital)

OUR experience at the Barnes Hospital of the Washington University Medical School in the treatment of carcinoma of the cervix with radium and x-ray, now extends over a period of ten years. Preceding that time surgery was the only established resource of the profession in cancer of the cervix. While the splendid development of surgery in the form of the radical operation for this condition registered a brilliant triumph and rescued many patients from death by cancer, the operation itself carried a high mortality. The persistent world-wide search for a less dangerous remedy brought out many so-called "eures." Time and time again the profession was carried to the pinnacle of hope, only to be dropped to bitter disappointment. The repetitions of this process naturally made gynecologists very critical of new remedies for cancer. Radiation, like other proposed remedies, had to meet this healthy spirit of skepticism and analysis, which constitutes the cancer patient's only protection against fake "eures" and mistaken "cures." In the beginning of radium work and x-ray work, the results justified continued skepticism. However, improvements in materials, technic, and increasing experience in the use of these powerful remedies, finally produced results that stand up under the most rigid analysis, and that placed radiation alongside surgery as an effective remedy for cancer of the cervix.

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

Experimentation is going on at an increasing rate in many well-equipped institutions, and we hope the future will bring a still more effective remedy. But for the present the only reasonable chance of cure rests on these two remedies, effective surgery or effective radiation.

Effective radiation treatment began a decade ago. Much experimentation in radium and x-ray work was carried on before that time, but it was about that time that radiation reached the effectiveness that established it as a real cure for carcinoma of the cervix. Radiation cured many cases that were beyond reach by even the most radical operation. Its striking effect in such cases caused it to be used earlier and earlier in the disease, with increasingly good results, until now it has supplanted operation in all except the very earliest cases. Even in these very early cases, radiation results are challenging those of surgery.

The change in treatment brought about by the work of ten short years is very striking, even startling. The physicians now coming on the stage of action can hardly appreciate the cancer treatment situation only a decade ago, and physicians who have not kept up with these revolutionary cancer developments are in no position to advise a patient with cancer of the cervix.

As part of our study of the various questions connected with cancer of the uterus, we have just completed an analysis of the series of cases treated more than five years ago. This series comprises the patients handled in the teaching wards of the Barnes Hospital, and also my private patients and those of Dr. Q. U. Newell, associate in the teaching.

The laborious statistical analysis was carried out by Dr. Newell. Only those who have been in close touch with such work, can realize the many difficulties to be overcome in various directions. For example, the tracing of the "disappeared" cases to final outcome, required innumerable visits by the social workers of the Service, and letters to patients and their physicians and neighbors (as to where individuals had moved), and to postmasters and to bureaus of vital statistics, and finally to the Red Cross workers in various towns, who gave much help in certain instances. The pathologic grouping by cell-types was carried out by Dr. Robt. J. Crossen, who reviewed all slides, and in many cases cut new sections for study.

This series showing five-year results, consists of 121 cases, treated from July 1, 1921 to April 1, 1926. Of these 121 carcinomas of the cervix, 108 were squamous-cell carcinoma and 13 were adenocarcinoma. Classed clinically according to extent of involvement, 2 were in Group I (cervix only involved), 1 was in Group II (slight parametrial involvement but no fixation of uterus), 108 were in Group III (extensive parametrial involvement with fixation of uterus), and 10 were in Group IV (extensive involvement of vagina or bladder or rectum as well as of parametrium). Fifteen patients could not be traced, in spite of all the various expedients employed. These lost patients were counted as dead from cancer, though some of them may be living.

The 2 patients in Group I were subjected to operation without radiation. They are both living, one nine years and the other eight years after treatment. One of these patients developed a ureterovaginal fistula eight days after the radial abdominal operation. Six months later (February, 1922) the right ureter was transplanted into the bladder. Recent follow-up showed no urine from the right ureter. The right kidney has apparently atrophied to complete nonfunction, but the patient is in good general health without local symptoms. The one patient in clinical Group II was given 3800 mg. hr. of radium and, after seven days, abdominal hysterectomy was performed. This was followed by deep x-ray therapy two weeks after operation and again in three months. This patient is living, seven years after treatment. Of the 108 patients in clinical Group III (extensive involvement of parametrium with fixation of uterus to pelvic wall), there were 24 five-year survivals and 21 of these are still living, some as long as eight years since treatment. Of the 10 patients in clinical Group IV (extensive involvement of vagina or bladder or rectum in addition to parametrium), not one survived five years.

The 100 per cent survival of patients in clinical Groups I and II is, of course, of no special statistical significance. These 3 patients happened to survive, but a glance over later series shows a survival percentage more nearly approaching those in recent literature for like involvement and similar treatment. The very large proportion of advanced cases in this series, makes the percentage of cures decidedly less than if there had been a fair proportion of early cases. However, of the 108 patients in clinical Group III (parametrial involvement fixing uterus to pelvic wall) 21 per cent were cured, a gratifying percentage for such advanced cases.

The conclusions presented in this paper, as to choice of treatment in different classes of cases, are of course based on cases treated in the last five years as well as on those treated more than five years ago. Each case is studied and treatment decided on, in the light of the experience gained in preceding cases. The difficulties encountered in securing results with the different methods of treatment in the different classes of cases—lessons from the failures and from the successes of the last ten years' work with this disease—all enter into the conclusions given later.

In every case admitted to the series, the diagnosis of carcinoma was confirmed by microscopic examination. Classifying the 108 squamous-cell carcinomas according to cell type, 23 were Type I (preponderance of mature cells), 48 were Type II (transitional), 11 were Type III (preponderance of immature cells, embryonal type), and 26 were indeterminate.

The "indeterminate" were indeterminate, usually, because of partial necrosis of the cells, the cell picture being sufficiently clear to show carcinoma but not sufficiently clear to establish the predominating cell

type. This emphasized the importance of certain details in specimen excision. The older, probably necrobiotic tissue, should be avoided and the specimen should reach into the active penetrating portion of the growth. On the other hand, it is important in specimen excision to avoid penetrating beyond the protective leucocytic wall, which guards against the lymphatic spread of the virulent bacteria often present in the crevices of a carcinomatous mass. Another reason for care in specimen excision is that a very small specimen may not go deeply enough to reach the carcinomatous process, taking in only the inflammatory and circulatory disturbance overlying it. In some cases of clinically appearing carcinoma of the cervix, the specimen removed at the radium treatment showed only chronic cervicitis. In certain of these cases I am satisfied from personal observation or subsequent development that there was a carcinoma, but as they lacked microscopic confirmation, they were excluded from the series, and the number of cured cases was reduced accordingly.

Classifying the 24 radium five-year survivals according to cell type, there were 5 survivals of the 23 showing cells of Type I (mature cells), 8 survivals of the 48 having cells of Type II (transitional), 5 survivals of the 11 showing cells of Type III (embryonal), and there were 6 survivals of the 26 of indeterminate cell type. Of the two very early cases subjected to operation only, and still surviving nine and eight years afterward, both were squamous-cell carcinomas—one showing cells of Type I and the other indeterminate. The one case in clinical Group II (some parametrial involvement, but no fixation of uterus), subjected to radium and operation and subsequent x-ray and still living after seven years, was adenocarcinoma of the cervix. The cell type apparently does not have a great influence on survival of the patient, certainly very little compared to the clinical classification according to extent of growth. Referring to the preceding clinical classification based on extent of growth, there were 100 per cent survivals in clinical Groups I and II, 21 per cent survivals in clinical Group III, and not a single survival among the patients in clinical Group IV. However, the survival of 5 out of 11 having cells of Type III compared to survival of 5 out of 23 having cells of Type I, furnishes further confirmation of the generally-held opinion that radiation is decidedly most effective in the immature or embryonal cell type. The other conditions were practically the same for the different cell types, all except 3 of the 27 survivals being in clinical Group III (extensive parametrial involvement with fixation of uterus) and receiving radiation treatment only.

I shall not trouble you with an array of statistical tables. In the various clinical classes and pathologic types our results do not differ materially from those that have been recently presented in the literature. The subject of carcinoma of the cervix is such a complicated one and presents so many clinical and pathologic variations and special problems in the adaptation of the details of treatment to the individual

case that it overflows tabular analysis. As we treat and observe patients day by day, endeavoring to give each patient the benefit of experience gained in preceding cases, our conclusions and practice are influenced by many things that cannot be presented in statistical form. Consequently, in helpfulness toward effective treatment, a very important feature of a series-report is the summary which presents the observer's experienced conclusions on various points in question. There are three disputed phases of this subject on which I have reached very definite conclusions, (1) as to treatment for very early cases, (2) as to the essentials of effective radium treatment, and (3) as to prophylaxis of cancer of the cervix.

Thousands of workers in this field look to the members of the Society for guidance on these serious questions. I hope the discussion will bring out such general expression of experienced conclusions, as to give material help to those who are seeking light, and thus improve the treatment and results for their patients. Many patients are being subjected to operation who could be given a much better chance for life by effective radiation. Also, many patients are being treated with radium in a manner that falls far short of the effectiveness to which they are entitled. Hence the importance of clear and definite statements of conclusions by those who have had a large experience in the treatment of such cases.

1. WHAT IS THE BEST TREATMENT FOR THE VERY EARLY CASE?

The treatment of cancer carries a greater responsibility than the treatment of ordinary diseases. It has been said that a considerable proportion of human ailments are self-curative if given time, but cancer does not belong to that class. In cancer of the cervix, only the judgment and skill of the physician stand between that patient and certain death within a very limited time. The patient's survival is determined largely by the physician's judgment in the choice of remedy and his thoroughness in its application. Consequently, it is with a profound sense of responsibility that the physician makes the selection of remedy for the individual patient.

In the very early carcinoma of the cervix, is it surgery or radiation or a combination of the two, that will give the patient the best chance to survive?

Theoretically, we should be able to cure these patients with radium, with as great certainty and with far less danger than with the knife. But so far the actual results do not seem to justify entire displacement of the knife by radium in these early cases. It is hoped that advance in the technic of radiation will eventually place it far ahead of operation in the percentage of cures even in the early cases, but so far it has not been demonstrated that this hoped-for result can be secured uniformly.

The crux of the situation is that there is still uncertainty as to how far radium will be effective in the individual case. It gives wonderful results in most cases, but, on the other hand, in some cases it stops short of expected effectiveness. And the disconcerting thing about it is that we do not know why it fails where apparently it should succeed. Outside of the technical details of its application, its effect is evidently modified by the type of cancer cell present, by the type of tissue cell in the area, by the condition of the tissue cells in the particular case, and by the resistance or defensive power, both local and general, of that individual. These important items vary with each patient and we know so little about them, even in the normal or typical individual, that it is not strange there should be certain unexplained variations in results in clinical radium work.

It is this uncertainty that makes entire dependence on radiation hazardous in these very early cases, in which, presumably, no cancer cell has yet penetrated beyond the uterine border. We know what can be done with the knife. The uterus can be removed with fair safety and thus the contained cancer cells completely eliminated. We do not know the extent of effectiveness of radiation in an individual case until it is tried in that case. And in the time required for trial by radiation, the chance of cure by operation slips away.

On the other hand, entire dependence on operation in these cases carries the serious hazard of leaving cancer cells beyond the operative area. No matter how early the cancer, some cells may already have been carried far out in the parametrium. Radiation gives the chance of devitalizing such outlying cancer cells. Consequently, the patient is given the best chance of cure in these early cases by the employment of both operation and radiation—operation to insure certain removal of all cancer cells in the uterine wall, and radiation to devitalize any outlying cancer cells that may be present.

Operation is carried out in the very early cases only on the supposition that no cancer cells have penetrated beyond the uterine border, and that a comparatively safe hysterectomy gives a good chance of complete eradication of all cancer. Consequently, such operation should be a hysterectomy with the removal of only as much parametrium and adjacent vaginal wall as can be excised without material increase in the risk.

Having decided to give the patient with a very early carcinoma the benefit of both operation and radiation, then arise certain questions of detail. Should the radiation be in the form of radium or x-rays? When conditions are favorable for the application of radium, it is the most effective form of radiation for the devitalization of cancer cells within a short distance, such as in the cervix and parametrium. The function of the more widespread x-rays is to devitalize cancer cells that lie beyond the reach of the concentrated radium dose in the center. Consequently, from the radiation standpoint, it is advisable to give a concentrated

radium dose in the cervix before operation and follow this after operation with deep x-ray therapy embracing the whole pelvis.

From the surgical standpoint, however, the effect of a radium application in increasing the danger of subsequent operation must be considered. In my experience, radium application to the cervix tends to increase materially the danger of an abdominal hysterectomy carried out within a short time thereafter. This has been so evident and marked that I have ceased to use preliminary radium treatment in those cases in which the hysterectomy must be abdominal, depending on the x-rays instead. In the cases that can be handled by vaginal hysterectomy, I give a heavy dose of radium, as though depending on that for the cure, and then do the vaginal hysterectomy with removal of adjacent parametrium and vaginal wall. The vaginal hysterectomy is carried out very soon after the radium treatment, preferably at the same sitting at which the radium is removed, in order to minimize the inflammatory reaction and bacterial invasion which increase daily for several days after any such extensive disturbance about the cervix. I formerly waited several days after removal of the radium, but became convinced that this wait increased the danger of serious infection at operation. Some have proposed to delay the operation for some weeks, until the inflammatory reaction has subsided, but there are two objections to that plan. By that time the leucocytic infiltration has increased the difficulties of operation and, still more important, precious time has been lost—time enough for the condition to change from a strictly cervical limitation of the cancer to that in which the cancer has extended beyond.

Another question concerns the time for the x-ray treatment. In the early cases subjected to abdominal operation, should the supplementary x-ray treatment be given before or after operation? It seems to me much safer to do the operation immediately and reserve the x-ray treatment for later, when the patient has sufficiently recovered from the operation. In these very early cases the main object, to which everything else should yield, is the removal of the uterus before any cancer cells extend beyond its border. No one can tell what day the malignant cells will metastasize. Every day of waiting carries that danger. Consequently, there should be no delay, except that necessary to prepare the patient properly for the serious operation. Again, x-ray treatment given shortly before operation would increase the danger of the operation. X-ray treatment of sufficient depth and extent to devitalize cancer cells in the pelvis, has a marked upsetting influence on digestion and metabolism. Having to be given through large masses of tissues, including the intestines, the general effect is quite different from a radium treatment in which the dose is practically limited to the affected area. One of the reasons that an abdominal operation always carries a certain amount of risk, is that we cannot be certain of the margin of reserve in the patient's vital functions. Consequently, we should avoid any preoperative measure which materially disturbs the metabolism. In

these early cases prompt careful operation before the malignant cells pass beyond the border of the uterus is the vital thing, the x-ray treatment, on the supposition that some cells may already have metastasized, being of secondary importance.

The above plan of treatment for the very early case is based on the assumption that the patient is a good operative risk. If the patient is a poor operative risk, then her best chance of survival cancer-free, may be through radiation without operation. Another factor that may influence the decision in a borderline case, is the "malignancy index" according to cell type. Radiation has most effect in tumors with a preponderance of immature cells (Type III). This embryonal type is also most rapid in growth and in metastasizing, and consequently is less favorable for operation. On the other hand, the tumors with a preponderance of mature cells (Type I) are less influenced by radiation. This adult type is also slow in growth and in metastasizing, and hence is more favorable for operation. However, one difficulty in using the cell type as a guide in treatment is that the small specimen removed for diagnosis may not show the predominating cell type of that tumor.

The decision for or against operation, and of the extent of operation, turns on a balancing of the hazards pro and con: the hazard of operation, the chance of failure of radium to kill the cancer cells in that individual, and the chance of metastasis near and far. On account of the latter danger, it is advisable to employ deep x-ray therapy to supplement other treatment, whether the other treatment be radium or operation.

2. WHAT ARE THE IMPORTANT ITEMS IN EFFECTIVE RADIUM TREATMENT OF CANCER OF THE CERVIX?

This powerful remedy requires experienced judgment and skill in its use. It is as potent as the knife and in inexperienced hands may produce as disastrous results, either in the form of injury to adjacent organs or as failure to obtain results that might have been obtained by a really efficient application.

The beneficial effect of radium depends on the careful carrying out of many details. Only by careful study and accurate execution of numerous details, can the patient be given the best chance of cure. The essential details may be conveniently grouped under the following four headings: (a) careful study of conditions present in the individual case, (b) maximum dose of radium at first application, (c) supplementary x-ray treatment, and (d) follow-up and treatment of recurrences.

a. Careful Study of the Special Conditions Present in Each Case.—This is necessary in order to give the most effective radiation in the individual.

The patient's chance for life lies in devitalization of the outlying cancer cells. It is in this particular that radium can go further than the

knife or the cautery, killing cancer in inaccessible situations beyond the reach of these other measures. One must not allow his attention to be diverted from this vital point by the striking effect of radium on the nearer portions of the cancer. The destruction of the large mass of cells in the sloughing area and consequent healing are only incidental to reaching cancer cells much further out. This local destruction could be accomplished with the knife or with the cautery; there is nothing distinctive about it. The distinctive and superior effect of radium is the extension of differential killing effect to include cancer cells at the outermost margin of the growth. If we do not reach these outlying cells, our radium treatment has failed, except as a temporary palliative measure.

The size of dose of deeply penetrating rays that can be given depends on a number of factors, including the location and size of the cancerous mass, the amount of involvement of each of the various organs in the immediate vicinity, the extent and direction of ulceration, and especially the fixation of the bladder and rectum in relation to the carcinomatous infiltration. The accurate determination of these conditions and the utilization of that knowledge in effective radium treatment require a large amount of experience and skill in gynecologic work. While in some situations the radiologist without special local knowledge may give effective radium treatments, in carcinoma of the cervix conditions are such that the most effective treatment can be given only by the skilled gynecologist with adequate radium training. His special knowledge of pelvic anatomy and pathology and his training in accurate pelvic palpation and diagnosis must all be utilized in the supreme effort to reach the marginal cancer cells with effective radiation.

b. *Give the Maximum Dose at the First Application.*—The danger of recurrence lies in the deep cancer cells. Our real problem, as just stated, is to reach and devitalize these deep-lying cells. The best chance of doing this is by giving as large a dose as practicable of the deeply penetrating rays at the first application. This is accomplished by placing the heavily screened radium in the center of the cancerous infiltration and then packing away the rectum and bladder as far as possible, so as to allow the maximum dose. Never again will the conditions be as favorable for a devitalizing dose to the outlying cells as they are at the first application. If the opportunity is missed then, it will not return. I reached this conclusion near the beginning of my radium work a decade ago, and in all that has transpired since I have seen no reason to change it. On this point this series shows that of 17 patients receiving 5000 mg. hr. at the first application, 6 were cured (35 per cent), while of 79 patients receiving smaller doses, 14 were cured (18 per cent). All of these patients were in clinical Group III; i.e., there was parametrial infiltration fixing the uterus.

c. *Supplementary Deep X-ray Therapy.*—A heavy dose of radium in the center of the cancerous infiltration is undoubtedly the most effec-

tive form of radiation for devitalizing cancer cells within a reasonable distance. But in any case there may be scattered cancer cells beyond the reach of the radium. Deep x-ray therapy may devitalize these cells, which otherwise would not be reached.

While x-ray therapy is not so reliable as radium in its devitalizing effect, it is effective in some cases. I recall a striking case in point.

The patient, aged forty-eight years, who was a physician from a distant state, came to me in 1922 with a widespread carcinomatous process in the pelvis including extensive involvement of the parametrium and the vaginal and rectal walls. The infiltration had extended to the sphincter, with loss of fecal control. In spite of her suffering and the apparent hopelessness of the condition, the patient faced the situation with a calmness and interested cooperation which were inspiring. As conditions were not favorable for radium, x-rays alone were used. There seemed to be some checking of the process, and this encouraged continuation of the x-ray treatment, which was pushed to the limit by our roentgenologist, Dr. Sherwood Moore. In the course of several months, the ulceration healed, the dense infiltration diminished, fecal control largely returned, and the suffering disappeared. After two years, the patient was able to resume her practice to some extent. Examination at that time showed much scar tissue in the pelvis, fixing the structures to the pelvic wall and extending down the rectovaginal septum, but it was much softer than the former dense nodular infiltration, and showed no evidence of malignant activity. The marked improvement continued, the patient coming occasionally for observation and examination.

In March, 1928 the patient contracted pneumonia, of which she died. In the absence of complete autopsy, some deep recurrence cannot be excluded, consequently the case cannot be classed as a cure. However, the patient was rescued from severe suffering and lived in comparative comfort for six years after x-ray treatment alone of an apparently hopeless condition.

d. Careful Follow-Up of Cases and Treatment of Any Local Spots of Recurrence.—The importance of this and the good results often attained have been emphasized by a number of writers, and especially by Ward in his excellent presentation of the work of the Woman's Hospital of New York.

The local recurrences that are likely to yield to small radium applications are those in the vaginal wall, due to cancer cells that have wandered down beyond the reach of the radium applied in the cervix. If such a spot is recognized early, before any deep penetration, it may be cured by the dose of radium permissible in these conditions, especially by the employment of emanation in the form of gold or platinum "seeds." Of course, a large dose of radium, such as given at first, is not permissible after the bladder and rectum have been drawn in and fixed by the postradium sloughing and scar formation, for it would quickly penetrate into one or both of these organs.

Where there is deep recurrence, x-ray therapy is the main reliance in checking it. Various efforts have been made to reach these deep recurrences with an effective dose of radium, principally through an abdominal incision. Some good results have been reported but, on the whole, the outlook in this direction is not encouraging. The difficulty

is that a deep recurrence that can be recognized is usually a widespread recurrence, requiring such a large dose of radium that it can hardly be safely applied in the midst of large blood vessels and hollow organs. The best hope for these cases probably lies in the super x-rays, running up to 600,000 volts, which are now being developed.

The above four items in radium treatment of cancer of the cervix are the most important in endeavoring to give the patient the best chance to survive. There are two other items of considerable importance, though they are concerned not so much with devitalization of cancer cells as with the patient's general health. I refer, first, to measures for minimizing the spread of infection and, second, to efforts to build up the patient's health and general resistance.

Bacterial invasion is a serious accompaniment of carcinoma of the cervix. Bacteria swarm in the cancerous ulcerations and papillary formations and penetrate the tissues underneath, and complete disinfection is practically impossible. Any extensive manipulation in the area is likely to stir up additional bacterial activity. Pyometra is one form of such disturbing inflammation. A carcinoma of the cervix tends to occlude the cervical canal, blocking drainage and causing a collection of pus in the uterine cavity. This is one of the causes of fever and pelvic pain and tenderness of the corpus uteri in certain cases of cancer of the cervix. The diagnosis is confirmed by a flow of pus when a uterine forceps is introduced into the cavity and opened. Even when there has been no pyometra before, it may develop after radium treatment from the swelling of tissues about the cervical canal. To overcome pyometra, or prevent its occurrence, I have for several years made a practice of putting a small rubber-tube drain in the uterine cavity along with the radium, and leaving the tube in for a week or two afterward.

The other and more serious form of infection is that in which the bacterial invasion extends past the protective leucocytic wall about the carcinoma, and produces general sepsis. To prevent this, it is important to avoid making deep incisions or introducing needles that extend beyond the leucocytic wall of protection. This is one of the objections to the use of needles, the efficacy also of which in this situation I have always doubted. Several years ago, when this method of using radium was very popular, I visited a gynecologist who was using it, in order to see just how the danger of infection and of injury to ureters and blood vessels was avoided. In treating a patient, after disinfection of the surfaces the radium needles were inserted with critical care to avoid important structures, and everything seemed just right. In four days the patient was dead of sepsis, which began promptly after the needle treatment. The carcinoma was of only moderate extent and the patient in fair general condition, just such a case as ordinarily responds splendidly to radium applied within the defensive leucocyte wall.

The patient's general health and resistance are of course important in the fight to overcome invading cancer, and the patient should be

toned up by all available means, including blood transfusion, when her condition requires it. The helpfulness of transfusion in cases with low hemoglobin has been especially emphasized by Ward, in his article already referred to.

In connection with maintaining the patient's resistance, the depressing effect of general anesthesia is to be considered. General anesthesia is to be avoided when practicable. Nearly all of our radium applications were made simply under hyoseine-morphine sleep. Only in exceptional conditions did we find it necessary to supplement this with short gas or ether inhalation.

3. PROPHYLAXIS OF CANCER OF CERVIX

This is practicable and presents the best hope of further material reduction in deaths from carcinoma of the cervix. The time to cure cancer with greatest certainty is before it starts. Cancer of the cervix comes from long-continued irritation in the form of chronic cervicitis, usually accompanied with laceration, infiltration, and cystic change. These lesions are very obvious, and their rôle in cancer origin is generally known, and yet they are allowed to go on and on well into the cancer age. Great pains are taken, in cases of chronic cervicitis, to detect the first signs of cancer, so that treatment for cancer may be promptly instituted; whereas a safer plan is to remove the chronic cervicitis promptly, before it becomes cancer.

Chronic cervicitis may be cured by simple conical excision of the affected area of the cervix, and thus cancer is prevented. But when the process has once advanced from inflammatory hyperplasia to cancerous proliferation, cure is uncertain by even the most radical methods. Why delay and procrastinate, until the possibility of cure by a simple operation has slipped away?

I believe that this is a very important phase of the cancer problem. Repeated insistence, by gynecologists in their writings and in their teaching to students, that it is imperative to make prompt removal of chronic irritation in the cervix in the latter part of the childbearing period, will greatly aid in establishing this practice. When this practice becomes general throughout the profession, it will save many patients from death by cancer.

UNIVERSITY CLUB BUILDING.

BASAL METABOLIC RATES IN LATE PREGNANCY AND THE PUERPERIUM*

BY OTTO H. SCHWARZ, M.D., AND CHARLES DRABKIN, M.D.,
ST. LOUIS, MO.

(From the Department of Obstetrics and Gynecology, Washington University School of Medicine, the St. Louis Maternity Hospital, and Barnes Hospital)

FROM various reports in the literature concerning changes in the metabolic rate during pregnancy, one must conclude that there is undoubtedly an average increase of 15 per cent in the woman who is at full term, as compared to her rate in the nonpregnant state. Various authors have indicated that this increase in their determinations is around 5 per cent, whereas others have reported an increase of as much as 30 per cent for the normal pregnant woman.

According to DuBois, who reviews the subject of basal metabolism in pregnancy in the latest edition of his monograph on basal metabolism, during the first half of pregnancy the weight production of conception is negligible in comparison with that of the mother. Later there is a more rapid development of the fetus and also of the placenta and the inert liquor amnion. He mentions that matters are still further complicated by changes in body weight and by a pressure upward on the diaphragm which increases the labor of respiration. He states also that after parturition there are the new factors of involution of the uterus and development of the lacteal glands. Considering the above mentioned factors, he thinks it is difficult to interpret the rather limited work on this subject.

In a very thorough study on a single case throughout pregnancy and the puerperium, Sandiford and Wheeler found an increase in metabolic rate from the beginning of pregnancy with a rate of minus 3 per cent to a rate of plus 8 per cent. The day after delivery the rate had dropped to minus 6 per cent and remained in this neighborhood during the first week of the puerperium. By applying the Lissauer formula and estimating from this the surface area of the fetus, they concluded from the calculation of this case as well as from other cases in the literature that the energy production of a unit mass of the mother's protoplasmic tissue remains unchanged throughout the course of pregnancy, and that such increases in the total heat production as occur are due to the increasing mass of active protoplasmic tissue, consisting in large part of fetal tissue and in lesser part of maternal structures. The placenta was not considered in these calculations. The fetus, because of its uterine environment, should show an energy production much less comparatively than that of the mother or of the newly

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

born. During pregnancy a hypertrophy of the thyroid probably exists. Considering these things, it would seem that Sandiford's estimations are unusually interesting.

This work has interested us because numerous observations have been made during pregnancy which would indicate that there actually exists an increased activity of the thyroid gland normally. Changes in the thyroid gland are well known to occur in pregnancy, hypertrophy of the gland being definitely observed in from 70 to 80 per cent of all cases, according to Seitz. Changes in the gland are chiefly the increased vascularization, and the increase of the epithelial elements with a storage of colloid toward the end of pregnancy. These changes are strikingly shown by Seitz in the rabbit.

One of us, for his own satisfaction, studied a series of pregnant guinea pigs. It was observed that during the early half of gestation there was a marked increase of the epithelial elements with storage of colloid during the latter half of pregnancy, this storage disappearing to some extent during the three or four days before labor sets in.

Davis was able to show that if a woman with a normal thyroid had sufficient iodine during the course of normal pregnancy, her basal metabolic rate will remain within the normal limits, although it may show a slight increase toward the end of pregnancy. Further, Marsh and Murlin, who studied premature and undersized infants, confirming Talbot's work, found that premature infants produced 26.25 calories per square meter per hour, which is considerably less than for a middle-aged or young adult. Benedict and Talbot found for the newborn an average of 27.7 calories per square meter per hour. This should indicate that the protoplasmic tissue of the fetus in utero on account of its environment should be even less than that of the premature or newly born infant.

Recent investigations have shown rather clearly that the anterior pituitary has a definite influence on the activity of the thyroid. Bugbee and his associates, in discussing the function of the anterior portion of the pituitary, mention the recent work of Foster and Smith, which showed that the removal of the whole pituitary gland caused a 35 per cent reduction of the metabolic rate. This could be restored by daily transplantation of anterior pituitary gland, transplantation of posterior pituitary being without effect. This work with that of other investigators, such as Schwartzbach and Uhlenhuth, and Crew and Wiesner, leads to the belief that one of the hormones of the anterior pituitary activates the thyroid gland. This is interesting in view of the hypertrophy of the anterior portion of the pituitary gland in pregnancy, and also the overproduction of certain of its hormones.

In very recent observations Bockelman and Scheringer, determining the iodine content of the blood through pregnancy, found a distinct rise in blood iodine from the second until the tenth lunar month, their figures being 15.5 gamma per cent in the second month to 22.5 gamma per cent during the tenth month and showing a definite drop during the first two weeks of the puerperium. This confirms the previous work of Maurer, who also observed the rise in blood iodine toward the end of pregnancy.

Also recently, Anselmino and Hoffmann, by determining the action of serum of nonpregnant and pregnant women on the excised livers of mice, show that there is a glycogen-diminishing substance in the blood which is demonstrated more markedly in the serum of the pregnant woman. They concluded from this work that there is present in the blood of a pregnant woman a substance which causes a more marked diminution of the glycogen of the mouse liver. This can be demonstrated from the second month of pregnancy and increases toward the end of pregnancy, but diminishes almost completely by the eighth day postpartum. They consider this due to an increase of thyroid hormone in the blood.

As the thyroid gland is known to exhibit hypertrophic changes during pregnancy, one could assume that the basal metabolic rate should actually be increased in the mother. The deductions of Sandiford and Wheeler are contrary to this, and it is this that suggested the present study. Much of the data just mentioned have been accumulating since our work was started and it seems that this is further evidence that there is actually an increase of thyroid activity during normal pregnancy.

In view of these facts, we believed that the study of cases where consecutive determinations have been made daily before delivery and in the puerperium should throw some light upon this subject. During the last two weeks of pregnancy interesting changes are noticeable in the mother, chief of which is the fact that her weight does not usually increase in the same degree as previously, often it is stationary, and during the last week, sometimes actually decreases, although the uterine structures are continually increasing until term. This latter fact is well known clinically, because women who become definitely overdue frequently have unusually large babies. It was suggested, therefore, that metabolic rates determined in this manner daily for two weeks before and at least one week after delivery, might show some interesting changes. We have begun such work and this study is presented in the nature of a preliminary report, 17 patients in all having been observed.

The patients were hospitalized from two to three weeks before delivery and were put to bed at night after dinner and were not allowed to get up until after the determinations had been made. All other standards concerning these determinations were fully carried out. The calorimeters which were used were of the Krogh-Hagedorn and Benedict-Roth types. They were checked against the Benedict-Roth apparatus in the Department of Medicine. This is mentioned because the rates in several instances are considerably lower than are usually given for normal pregnant women, but since it is generally considered that figures formerly given were too high by about 8 per cent (DuBois), this would somewhat offset the variation. Further, the determinations being made by the same machine under the same circumstances, would make the curves reliable from the standpoint that the determinations were made always under the same conditions.

As a whole, there was a definite rise in rate in all cases during the period of about ten to three days before delivery. In some instances

TABLE 1

DAYS A.P.	CASE	1	2	3	4	5	6	7	8
14	Total Calories per hr.	61.2	69.9			70.0	70.4	62.0	62.9
	B.M.R.—%	+ 3.3	+15.9			+20.9	+14.1	+ 3.8	+ 8.9
	Weight in Kilos	56.7	60.0			55.4	67.0	56.5	61.0
13	Total Calories per hr.	58.1	68.9			69.2	68.4	62.0	60.9
	B.M.R.—%	- 2.0	+14.3			+19.4	+10.9	+ 4.1	+ 6.1
	Weight in Kilos	56.7	60.0			55.5	67.2	56.1	60.3
12	Total Calories per hr.	54.5	69.9			69.8	70.4	62.1	64.2
	B.M.R.—%	- 7.9	+15.9			+20.5	+14.2	+ 3.9	+11.5
	Weight in Kilos	56.7	60.0			55.4	67.3	56.5	60.5
11	Total Calories per hr.	65.1				69.9	69.3	60.9	62.8
	B.M.R.—%	+ 9.9				+20.8	+11.7	+ 2.2	+ 8.9
	Weight in Kilos	57.2				55.7	68.0	55.9	61.0
10	Total Calories per hr.	60.8				68.6		63.7	64.6
	B.M.R.—%	+ 2.6				+18.1		+ 6.4	+11.9
	Weight in Kilos	57.0				55.8		56.9	61.0
9	Total Calories per hr.	60.5	68.9	69.5		67.9	68.8	69.4	63.3
	B.M.R.—%	+ 2.2	+14.3	+ 3.8		+17.3	+10.9	+15.8	+ 9.3
	Weight in Kilos	57.0	60.3	70.5		55.5	68.3	57.4	61.6
8	Total Calories per hr.	60.9		80.0		68.0	67.6	60.5	59.5
	B.M.R.—%	+ 2.2		+19.1		+17.5	+ 9.3	- 0.2	+ 2.7
	Weight in Kilos	57.8		70.8		55.5	67.5	57.9	61.6
7	Total Calories per hr.	59.0	69.7	76.2				65.9	61.7
	B.M.R.—%	- 0.9	+15.6	+13.6				+ 9.2	+ 6.9
	Weight in Kilos	57.6	60.3	70.9				57.6	61.2
6	Total Calories per hr.	60.1	69.3	76.4		71.1	68.2	68.2	63.1
	B.M.R.—%	+ 0.9	+14.6	+13.8		+22.8	+10.3	+12.1	+ 8.9
	Weight in Kilos	57.5	60.5	70.8		55.5	67.5	58.4	61.7
5	Total Calories per hr.		68.2	74.6	72.8	68.3	68.7	68.1	61.4
	B.M.R.—%		+12.8	+14.0	+11.8	+17.6	+11.0	+12.3	+ 6.0
	Weight in Kilos		60.6	70.8	68.2	56.0	67.5	58.0	61.5
4	Total Calories per hr.		74.1		66.9	69.5		66.5	61.6
	B.M.R.—%		+22.5		+ 2.7	+20.4		+ 9.6	+ 6.3
	Weight in Kilos		60.5		68.0	55.2		58.3	61.6
3	Total Calories per hr.	63.4	70.6	72.7	69.8	67.2	69.0	68.1	60.0
	B.M.R.—%	+ 4.9	+17.8	+11.3	+12.5	+20.4	+13.6	+12.9	+ 3.6
	Weight in Kilos	58.1	60.5	70.5	67.7	55.1	67.7	58.3	61.6
2	Total Calories per hr.	63.4	70.6	72.7	69.8	67.2	69.0	68.1	60.0
	B.M.R.—%	+ 6.2	+16.7	+ 8.9	+ 7.3	+16.1	+11.9	+12.2	+ 3.2
	Weight in Kilos	58.3	60.8	70.4	67.7	55.4	67.3	58.3	61.8
1	Total Calories per hr.	61.0	71.2	74.7	63.0	68.7	68.7	66.9	63.0
	B.M.R.—%	+ 2.4	+17.7	+11.2	- 2.9	+18.7	+11.4	+10.5	+ 8.4
	Weight in Kilos	58.5	60.6	70.4	67.6	55.6	67.3	58.2	62.0
Labor started in hours:		7	5	12	6	24	6	4	24

TABLE I—CONT'D

DAYS P.P.	CASE	1	2	3	4	5	6	7	8
1	Total Calories per hr.	60.6	64.9	70.0	65.4	52.8	60.5	66.0	55.8
	B.M.R.—%	+ 4.3	+10.4	+ 8.6	+ 4.1	- 2.9	+ 0.6	+17.5	- 0.3
	Weight in Kilos	54.5	56.7	64.5	63.0	48.2	62.8	49.3	56.6
2	Total Calories per hr.	57.1	61.6	68.1	62.4	56.1	54.0	60.4	56.7
	B.M.R.—%	+ 1.2	+ 5.5	+ 6.3	+ 0.4	+ 2.8	- 9.2	+ 7.5	+ 1.9
	Weight in Kilos	54.4	56.2	63.6	61.3	48.7	60.8	49.1	55.5
3	Total Calories per hr.	61.3	59.8	65.6	59.6	54.9	55.3	53.6	55.4
	B.M.R.—%	+ 6.9	+ 1.9	+ 2.2	- 4.5	+ 0.7	- 6.7	- 4.5	- 0.4
	Weight in Kilos	53.2	56.4	63.9	61.7	48.6	60.6	48.9	55.0
4	Total Calories per hr.	59.2	59.2	65.4	64.1	54.9	53.4	52.8	53.7
	B.M.R.—%	+ 3.2	+ 1.3	+ 1.9	+ 2.6	+ 0.7	- 9.6	- 6.0	- 3.4
	Weight in Kilos	53.1	56.2	63.9	61.6	47.9	60.3	49.1	55.5
5	Total Calories per hr.		57.8	65.2	67.5	56.1	53.8		55.3
	B.M.R.—%		- 1.0	+ 1.9	+ 8.0	- 3.3	- 9.3		- 0.5
	Weight in Kilos		55.8	63.6	62.0	47.9	60.4		55.7
6	Total Calories per hr.						52.9	54.1	56.1
	B.M.R.—%						-10.4	- 3.1	+ 1.2
	Weight in Kilos					47.8	60.0	48.3	55.5
7	Total Calories per hr.	57.2	57.6	70.1	65.4	51.5	54.1	54.2	53.5
	B.M.R.—%	+ 0.5	- 0.4	+ 9.5	+ 4.6	- 5.3	- 7.7	- 2.9	- 2.1
	Weight in Kilos	52.0	54.5	63.4	62.0	47.0	59.5	47.8	54.1
8	Total Calories per hr.	62.4		69.1	62.8				
	B.M.R.—%	+ 9.4		+ 7.8	+ 0.5				
	Weight in Kilos	52.0		63.5	61.8	46.4			
9	Total Calories per hr.		57.2		64.5	52.8	54.9	49.6	53.1
	B.M.R.—%		- 1.0		+ 3.5	- 1.4	- 7.0	-11.2	- 2.5
	Weight in Kilos		54.7		61.5	46.5	59.8	48.2	53.5
10	Total Calories per hr.	51.9	54.8	64.6		51.9	53.4	50.2	51.8
	B.M.R.—%	- 8.2	- 4.9	+ 1.1		- 2.9	- 8.4	-10.1	- 4.8
	Weight in Kilos	51.2	54.3	62.8		46.5	59.2	48.0	53.5
11	Total Calories per hr.		55.3		58.9		52.3		52.1
	B.M.R.—%		- 4.1		- 5.4		-10.3		- 4.4
	Weight in Kilos		54.4		61.4	46.3	59.1		53.5
12	Total Calories per hr.	57.1	55.4	59.9		50.1		52.5	
	B.M.R.—%	+ 0.8	- 3.8	- 6.1		- 6.5		- 6.2	
	Weight in Kilos	51.3	54.3	63.1		46.3		48.5	
13	Total Calories per hr.	61.2	53.1	59.8			53.6	54.7	48.7
	B.M.R.—%	+ 8.1	- 8.0	- 6.3			- 8.1	- 2.6	-10.5
	Weight in Kilos	51.3	54.4	63.0		46.4	59.1	49.2	53.6
14	Total Calories per hr.					50.7	52.9		47.9
	B.M.R.—%					- 5.4	- 9.1		-12.0
	Weight in Kilos					46.4	58.5		53.5
6 wk. P.P.	Total Calories per hr.			60.1			50.1		
	B.M.R.—%			- 5.2			-15.7		
	Weight in Kilos			63.0			61.0		

this rise was persistent, particularly, to the time of delivery and in several cases there was a definite drop before labor set in. The details can be best studied in Tables I and II.

A marked drop was observed in eight instances, a slight drop in six, and a definite rise in three. (See Table III.) In considering the rate of the fetus the same as the mother, the drops observed do not correspond in any definite way to the actual rate obtained after delivery.

TABLE II

DAYS A.P.*	CASE	9	10	11	12	13	14	15	16	17
14	B.M.R.—% Weight in Kilos			- 9.1 59.0	- 7.0 64.0	-32.6 64.5	-14.8 52.0			
13	B.M.R.—% Weight in Kilos					-21.3 64.8	-17.8 52.8		- 2.6 88.0	
12	B.M.R.—% Weight in Kilos	+10.0 61.5			- 9.8 64.5	-31.9 64.5	-16.3 52.0			
11	B.M.R.—% Weight in Kilos					-29.0 64.5	-17.4 53.0		- 4.1 88.5	
10	B.M.R.—% Weight in Kilos	+ 8.0 62.5		+ 8.3 59.0	-11.4 64.5	-29.4 64.2	-13.2 52.0		- 5.7 89.0	
9	B.M.R.—% Weight in Kilos	+ 9.4 62.5		- 5.7 59.0						
8	B.M.R.—% Weight in Kilos	+13.8 62.0		- 6.1 59.0	-10.4 64.0	-18.4 65.0	- 3.1 52.5		- 6.6 89.0	
7	B.M.R.—% Weight in Kilos		+ 4.3 64.0	-17.8 59.0				- 3.4 60.0		-11.2 51.5
6	B.M.R.—% Weight in Kilos	+15.6 62.0		- 9.6 59.0		-16.2 64.5	- 2.2 52.5	- 1.6 58.0		
5	B.M.R.—% Weight in Kilos	+ 8.0 62.0	+ 6.9 64.5	-16.3 59.0	- 9.4 65.0	- 9.6 64.5	- 6.8 52.5		- 9.7 90.0	-13.8 52.0
4	B.M.R.—% Weight in Kilos					- 6.5 64.5	+ 8.0 52.5	- 2.8 57.5	- 0.8 90.0	
3	B.M.R.—% Weight in Kilos	- 3.3 62.5	+ 1.6 64.0	-13.2 59.0	- 7.7 65.0		+ 5.1 52.5		+ 0.2 89.0	- 6.4 51.5
2	B.M.R.—% Weight in Kilos	- 2.0 62.5	+ 6.4 64.0	-11.6 59.0		- 7.7 65.0		- 3.4 58.0		- 7.0 52.0
1	B.M.R.—% Weight in Kilos	+ 1.2 62.5	+ 8.0 64.0	- 9.9 59.0	- 6.4 65.0	-12.6 65.0	+ 6.4 51.5	- 1.8 57.5	- 8.6 89.0	- 7.0 52.0
DELIVERY										
HR.										
P.P.										
8	B.M.R.—% Weight in Kilos	+16.2 58.5	- 0.4 58.0		(12 hr.)	- 6.3 60.0	- 3.6 49.5	-12.2 53.0		
32	B.M.R.—% Weight in Kilos	+11.5 58.0			(36 hr.)	- 6.6 58.5		(18 hr.)	-11.6 81.0	

*Antepartum.

TABLE II—CONT'D

DAYS P.P.	CASE	9	10	11	12	13	14	15	16	17
1	B.M.R.—% Weight in Kilos			-10.8 53.0	- 7.3 59.0					-15.4 46.5
2	B.M.R.—% Weight in Kilos	+ 3.4 58.0	-13.6 53.0	- 8.4 58.5		- 4.8 49.0	- 8.3 52.0	-20.4 80.0		
3	B.M.R.—% Weight in Kilos					-10.1 59.0			-20.1 80.0	-21.3 46.5
4	B.M.R.—% Weight in Kilos	+ 3.9 57.5	+ 8.6 58.0		- 5.9 57.5	- 4.7 58.5	- 6.2 48.0	+ 6.1 52.0	-23.3 80.0	
5	B.M.R.—% Weight in Kilos	+ 1.4 56.5	+ 1.1 58.0	-19.5 52.0		-10.7 58.5		+ 1.6 51.5	-17.3 80.0	-22.1 46.5
6	B.M.R.—% Weight in Kilos	- 3.6 56.5	+ 4.4 57.0		-11.4 57.0			+ 4.2 51.0	-22.7 79.5	-19.7 46.0
7	B.M.R.—% Weight in Kilos	- 6.9 56.0	+ 2.0 56.0	-15.5 50.0						
8	B.M.R.—% Weight in Kilos		- 4.8 56.0					- 0.3 50.0	-11.8 77.5	-20.6 45.5
9	B.M.R.—% Weight in Kilos	- 7.1 56.0	- 5.7 56.0	-17.8 49.5	-10.8 56.5			+ 3.5 50.5	-12.8 77.0	
10	B.M.R.—% Weight in Kilos					-27.1 57.5				-20.6 45.0
11	B.M.R.—% Weight in Kilos	- 8.9 56.0	+ 3.7 56.0					- 2.2 51.0		
12	B.M.R.—% Weight in Kilos	- 7.6 56.0	+ 6.6 56.5				-17.9 43.0	- 4.1 51.0		-27.3 46.0
13	B.M.R.—% Weight in Kilos				-10.6 56.5		(8 wk.) 50.0	- 3.9 50.0		

This is true also, but to a less degree, when the rate of the fetus is determined from the average rate that is given for newly born infants which is 27 calories per square meter of body surface.

From these figures, it can be seen that we have found no consistent drop following delivery comparable to the estimated metabolism of the fetus. In a good many instances the drop is entirely insufficient, and in another instance there is actually a rise. It would seem, therefore, if these determinations are approximately correct, that a good many factors must come into play during the period before and after delivery, which might cause such variations. We feel that from some of the determinations, there is actually some evidence of an increased energy production of the mother during pregnancy. We realize very definitely that this is a clinical investigation in which the methods used are only approximate, and from the somewhat varied results, no definite con-

TABLE III

CASE	BEFORE DELIVERY			AFTER DELIVERY			FETUS AT RATE OF MOTHER			CALCULATION BEFORE DELIVERY				FETUS AT AV. RATE OF NEW-BORN			MINUS FETUS	
	CAL. PER HR. S.A.†	B.M.R. PER CENT		CAL. PER HR. S.A.	B.M.R. PER CENT		CAL. PER HR. S.A.	B.M.R. PER CENT		CAL. PER HR. S.A.	B.M.R. PER CENT			BORN CAL. PER HR. S.A.			CAL. PER HR. S.A.	B.M.R. PER CENT
1	61.0	+2.4		60.6	+4.3		7.0			54.0	-8.3			4.9			56.1	-4.7
2	71.2	+17.7		64.9	+10.4		10.0			61.2	+4.4			6.0			65.2	+11.2
3	74.7	+11.2		70.0	+8.6		8.9			65.8	+0.9			6.0			68.7	+5.5
4	68.0	-2.9		65.4	+4.1		7.5			55.5	-12.2			5.7			57.3	-9.4
5	68.8	+18.7		52.8	-2.9		11.5			57.3	+2.5			7.0			61.8	+10.6
6	68.7	+11.4		60.6	+0.6		9.8			58.9	-2.1			6.5			62.2	+3.3
7	66.9	+10.4		60.5	+7.5		9.5			57.4	-2.4			6.2			60.7	+3.2
8	63.0	+8.4		55.8	-0.3		7.8			55.2	-3.1			5.1			57.1	+1.6
9	61.6	+1.23		68.8	+16.25		7.4			54.2	-8.3			5.4			56.2	-4.9
10	63.2	+8.0		56.0	-0.4		7.7			55.5	-2.9			5.1			58.0	-1.6
11	52.6	-9.9		49.0	-10.8		7.0			45.6	-20.0			5.7			46.9	-17.0
12	59.5	-6.4		56.4	-7.3		7.7			51.8	-14.4			5.9			53.6	-11.4
13	59.3	-12.6		61.0	-6.3		6.6			52.7	-20.0			5.1			54.2	-17.8
14	57.3	+6.4		51.4	-3.6		8.6			48.7	-7.2			5.9			51.4	-2.1
15	57.2	-1.8		49.3	-12.2		8.9			48.3	-14.0			6.5			50.7	-9.8
16	73.0	-8.7		67.0	-11.6		9.1			63.9	-18.3			6.7			66.3	-15.2
17	56.3	-7.0		49.8	-15.4		7.0			49.3	-16.7			5.1			51.2	-13.5

*Without Placenta.

†Surface area.

elusions can be drawn either in regard to an increased energy production of the mother per se during pregnancy or to a stationary one.

We offer these determinations as a preliminary report and make no definite conclusions from our present experiences, but shall reserve these until further data are obtained.

REFERENCES

- (1) *Sandiford, I., and Wheeler, T.*: J. Biol. Chem. 62: 329, 1924-1925 (Additional references given in this article). (2) *Scitz, L.*: Arch. f. Gynäk. 137: 608, 1929. (3) *DuBois, E. F.*: Basal Metabolism in Health and Disease, Lea and Febiger, 1927, Philadelphia, pp. 134-138 and 351. (4) *Ausclmino, K., and Hoffmann, F.*: Arch. f. Gynäk. 143: 310, 1930. (5) *Bokelmann, O., and Scheringer, W.*: Arch. f. Gynäk. 143: 512, 1931. (6) *Davis, C. H.*: Transactions of Section on Obst., Gynec. and Abdom. Surg., J. A. M. A., p. 145, 1926. (7) *Plass, E., and Foakam, W.*: AM. J. OBST. & GYNEC. 18: 556, 1929. (8) *Bugbee, E. P., Simond, A. E., and Grimes, H. M.*: Endocrinology 15: 41, 1931.

CLINICAL STUDY OF POSTOPERATIVE VALUE OF BARBITURIC ACID HYPNOTICS*

BY ALICE F. MAXWELL, M.D., SAN FRANCISCO, CALIFORNIA

(From the University of California Medical School)

THIS investigation was undertaken to determine the clinical effects of barbituric acid hypnotics used postoperatively in 471 gynecologic patients subjected to laparotomies and to evaluate their efficiency as substitutes for opium derivatives.

The discoveries of Pasteur in the field of bacteriology, the recognition of the principle of antisepsis by Lister and the boon of anesthesia established the Renaissance in surgery. Despite the range and development of modern operative therapeutics, surgical hazards have been tremendously reduced by the standardization and improvement of technique, and by an appreciation of underlying basic principles. Yet the acknowledgment that operative risks do exist has served as a challenge and stimulus to medical research and scientific investigation, reflected in the acquisition of new facts which have further safeguarded the patient. The discovery of insulin has revolutionized the medical and surgical treatment and prognosis of the diabetic, the recognition of the value of iodine in the preparation of the toxic exophthalmic patient has eliminated one of the great surgical problems, and the rôle of calcium in preventing hemorrhage has given the surgeon a sense of security when operating upon the jaundiced patient. Examples possibly less dramatic but none the less significant are the modifications of the preoperative preparation of the individual. The universal custom of purging and starving for several days before operation has been supplanted by a more rational attitude based upon the demands of physiologic function. Intestinal

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

peristalsis is disturbed by catharsis and alteration of bowel function is followed by ileus and distention. The necessity for the preoperative administration of fluid and food (especially carbohydrates) is apparent when we consider the important rôle of tissue water-balance and acid-base equilibrium in normal function. Recent advances in the field of anesthesia indicate that the search for the ideal anesthetic continues and suggest that important developments may be looked for in that direction. This investigation was stimulated by a dissatisfaction with the postoperative effects of opiates which developed because of the pharmacodynamic action of the drugs.

Preoperative Preparation.—The keynote of preoperative preparation is prophylaxis and, to minimize surgical risk, attention is directed to the study of the individual's functional capacity, and the correction of unfavorable modifying factors which might lead to postoperative complications. Briefly, it includes a complete physical examination, uranalysis, kidney function tests, blood count, Wassermann, sedimentation and blood pressure readings. Any variation from the normal standards demands further investigation or corrective therapy. A liberal diet is given and water and high calorie fruit juices are forced until a few hours before the actual operation. Berwick's dye (alcoholic solution of brilliant green-crystal violet) is applied to the gums to fortify oral hygiene, and physical and psychic rest is assured during the night preceding surgery by administering sedatives or hypnotics. An enema the morning of operation is routine.

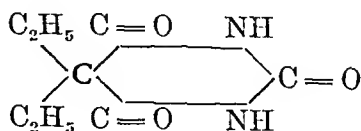
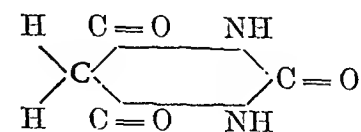
Long-established custom has sanctioned the use of opiates for preanesthetic hypnosis for the purpose of depressing the general metabolic level to facilitate the induction and administration of the anesthetic, and to relieve the apprehension incident to the anesthetic itself. The rationality of preanesthetic opiates must be questioned, however, when we review some of the undesirable effects which follow the use of morphine and allied drugs. The respiratory depression, the disturbance of metabolism, and the occasional excitement which occurs after opiates must suggest that they are not the ideal or necessary adjuncts to anesthesia. Recently we have substituted barbiturates to secure preanesthetic hypnosis, with entirely satisfactory results.

Postoperative Care.—Following operation, the immediate concern of the surgeon is the maintenance of body heat, the restoration of fluids lost by skin evaporation or hemorrhage, the stimulation of the organs of elimination, and the relief of pain. Our interest was especially centered in the latter. Pain after laparotomy is inevitably present, due to the operative procedure itself, and though there is a marked individual and racial variation in pain threshold, it is of vital importance to reduce discomfort to a minimum. From this standpoint, opiates have been the most valuable drugs in the pharmacopeia, for unquestionably they do alleviate pain; however, their use is also attended with undesirable fea-

tures which definitely increase the possibility of postoperative complications. Intestinal motility is always depressed by abdominal procedures and opiates, because of their inhibitory action on peristalsis, increase bowel atony and distention. Moreover, intestinal stasis favors the rapid development of gas-forming organisms, which further complicates the picture. It is generally agreed that disturbance of the acid-base balance occurs after a general anesthetic, and opiates, by virtue of their action on the vomiting center, further increase acidosis. The depression of the respiratory center after morphine results in slower elimination of the anesthetic, and lessened pulmonary ventilation which favors atelectasis and, finally, idiosyncrasy is not uncommon and manifests itself by excitement and sleeplessness. These criticisms seemed valid reasons for investigating substitutes against which such objections could not be raised and yet which were effective in controlling postoperative discomfort. To be acceptable, the therapeutic agent must necessarily meet certain standards; namely, 1. A wide margin of safety between the medicinal and toxic dose; 2. Ability to relieve pain and induce sleep. 3. No effect on vital functions. 4. Prompt elimination.

Hypnotic Drugs.—Hypnotics, because of their specific effect upon the psychic centers, seemed a logical choice. These drugs, except hyoscine, are synthetic compounds which vary in chemical composition; their somnifacient action is enhanced by certain chemical groups. Ketone and aldehyde linkings are often found, ethyl and propyl side-chains are usual, and while halogen compounds increase the hypnotic effect, circulatory depression is more marked. Synthetic hypnotics may be classified as follows: 1, polymeric aldehydes (paraldehyde), unpleasant because of disagreeable aftertaste and breath; 2, di-ethyl sulphones (sulphomethane), dangerous action on kidney and slow and uncertain absorption; 3, carbamates (hedonal), too weak; 4, halogen compounds (chloral), too depressing to heart and circulation; 5, malonyl-urea derivatives (barbital, etc.), satisfactory from a pharmacologic viewpoint.

Barbiturate Acid Compounds.—Barbituric acid has the following chemical structure:



The addition of two ethyl radicals to the di-ethyl malonyl urea produces barbital. This drug (trade name "veronal") was introduced in 1903 and since then many modifications of the original substance have

been exploited. The substitution of phenyl, allyl, propyl, butyl, etc., for the ethyl radical enhances the hypnotic action but at the same time increases the toxicity of the preparation. Pheno-barbital ("luminal"), di-allyl barbituric acid ("dial"), iso-amyl-ethyl barbituric acid ("amytal") are some representatives of such modifications.

Barbiturates are not soluble in water except when prepared as alkaline salts but are readily absorbed from the stomach. A small proportion is destroyed in the body but the greater part is eliminated unchanged in the urine within ten to twenty-four hours. There may be cumulative effect. The systemic action is practically limited to the central nervous system, particularly the brain and cord; the peripheral sensory and motor nerves are undisturbed. The sensory cortex is more depressed than the motor, except after phenobarbital ("luminal"), which has a selective depressant action on the latter. Reflexes are disturbed before the pain sense. Special senses are rarely altered, although at times there may be papillary dilatation and loss of light reflex. Even in toxic doses, there is no disturbance of the digestive function. The blood is not altered, the heart is not influenced. Peripheral blood vessel dilatation may occur, leading to sweating which may cause cutaneous lesions, especially on the face; but this dilatation is not dependent upon paralysis of the arterioles, as shown by typical ephedrine response.

Toxic symptoms are manifested by periods of motor excitement, muscle twitching and ataxia, followed by shallow periodic respirations and coma. Lethal doses cause respiratory paralysis, and postmortem examination shows dilatation of the heart, congestion of the brain and viscera, and edema of the lungs.

Studies of the effect of barbituric acid hypnotics in human subjects (Anderson, Chen, Leake) showed that "barbital, ipral, neonal, and phanodorm tend to reduce oxygen consumption and tactile discrimination. Amytal and phenobarbital tend to increase oxygen consumption except in relatively high dosage. Barbital seemed more universally depressing than its common derivatives, not only on basal rate and attention, but also on pulse rate and blood pressure." Barbiturates are essentially sleep-producing drugs and are not analgesics except in large doses.

To determine the value of these hypnotics after operation, it seemed rational to combine them with an agent specifically analgesic. Experimental evidence has indicated that amidopyrine acts synergistically with the barbiturates (Van Noorden) and that mutual antagonism in the toxic action of each agent exists (Starkenstein, Kaër and Loewe). Allyl-iso-propyl barbituric acid and amidopyrine (Allonal) was first studied from this standpoint. This preparation, dispensed in 0.15 grams (2- $\frac{3}{8}$ grain) tablets is a loose chemical combination of a hypnotic and analgesic in the proportion of 1:1.66.

Technic of Administration.—Four tablets (0.6 grams) of the drug were crushed and given by mouth in a small amount of water as soon as

postoperative nausea had ceased. When the patient began to arouse, usually five or six hours later, the same dosage was repeated; and, depending upon the indications, a similar amount was repeated usually eight hours later. Subsequent dosages were reduced to 0.3 grams and were given when pain and sleeplessness indicated that the effects of the medication were wearing off. Individualization and experience facilitated the recognition of the need for further medication. However, in all cases it was discontinued on the third day after operation. In some cases, four grams of sodium bromide in a retention enema were given as soon as the patient returned from the operating room, and was repeated in six hours. A review of our data indicates that the bromide was a partial but not a necessary adjunct to the barbiturate. Because we appreciate the difficulties of medication by mouth after a general anesthetic, we employed this method of administration as offering a more rigid test for evaluating the medication and important in eliminating any psychic element incident to hypodermic injection.

Two and one-half to three liters of normal salt solution were given by hypodermoclysis when the patient returned from the operating room, and warm water by mouth was forced as soon as fluids were tolerated. The hypodermoclysis was repeated or intravenous glucose was given when it was deemed necessary. If the patient was unable to urinate after twelve hours, the bladder was catheterized followed by an instillation of silver nitrate solution. To avoid retention, after voiding, the catheter was used until it was demonstrated that there was less than 30 c.c. of residual urine in the bladder. On the third postoperative day, an enema was given and the patient was usually on a light diet.

Reaction to Allonal.—Within one hour after the first dose of allonal had been given, there was definite control of pain and often sleep ensued. Subsequent medication was followed by several hours of quiet sleep or periods of sleep interrupted by restlessness or delirium. Occasionally, restlessness prevented sleep. The importance of protecting the patient during these often sudden onsets of delirium was forcibly emphasized in the early part of this investigation when several patients attempted to or actually climbed out of bed. This need was successfully met by attaching high canvas frames to the sides of the bed. Subsequent questioning of the women often revealed an underlying factor of financial worries or home difficulties which probably offered an unfavorable modifying background. The neurotic or highly nervous person was more prone to delirium; Orientals and the phlegmatic type were usually placid and relaxed. On the other hand, we soon learned to recognize that delirium appearing after forty-eight hours of medication indicated an overdosage of the drug and increasing experience enabled us to gauge the dosage so as to avoid this complication. At times, thickening of speech or inability to swallow liquids was noted, undoubtedly the result of muscle incoordination. Complete recovery from the nar-

cosis was apparent within twelve to twenty-four hours after the medication terminated. Blurred vision or diplopia was occasionally present during this phase. During the period of "allonal narcosis," the temperature, pulse, and respiratory rate were carefully observed, special emphasis was placed upon the frequency and severity of postanesthetic vomiting, distention, or any complication which could be attributed to the medication.

ALLONAL SERIES, 381 PATIENTS

Allonal was used postoperatively in 381 women, all of whom had laparotomies. Because we considered that control of pain incident to abdominal surgery would offer a more crucial test of the efficiency of the drug, we have not included in this report any patients having only a vaginal plastic operation, for there is rarely marked discomfort in this group.

The operative procedures are shown in Table I.

TABLE I. ALLONAL SERIES—381 PATIENTS

Hysterectomy	159
Suspension uterus	90
Cesarean section	26
Myomectomy	9
Salpingo-oophorectomy	97

These operations were indicated for the treatment of uterine and ovarian cancers, fibroids, uterine displacements, inflammatory disease or tumors of the adnexa, endometriosis, and pregnancy. Vaginal and cervical repairs and appendectomy were done when it was indicated.

144 women received allonal alone after operation	(All.)
77 women received allonal and one hypodermic of opiate	(All.0 ¹)
81 women received allonal and two hypodermics of opiate	(All.0 ²)
79 women received allonal and three hypodermics of opiate	(All.0 ³)

Opiates were given once or twice because immediate postoperative nausea prevented mouth medication or because the patient's restlessness interfered with the comfort of other ward patients. The indications for three or more hypodermics are shown in Table II:

TABLE II

Excitement after allonal narcosis	28
Excitement during allonal narcosis	24
Vomiting	17
Opiates preceded allonal	7
Postoperative pneumonia	2
Morphine addiction	1
	79

Opiates could probably have been eliminated, except in the group (52) of women who were excited from an overdose of hypnotic and in the

morphine addict, by hypodermic administration of the hypnotic. However, we felt that the subgroups which were based upon the number of opiate hypodermics might offer an interesting basis of comparison with the group in which no opiates were given.

In any discussion of postoperative nausea and vomiting, certain factors must be considered; namely, individual susceptibility, type and duration of anesthetic, and local irritation. With the exception of the 26 pregnant women delivered by cesarean section under nitrous oxide, the anesthetic agent was ether. Ether is more likely to cause nausea and vomiting than are nitrous oxide or ethylene; and, while there was no vomiting in 65 per cent of the cases, it is probably fair to attribute the

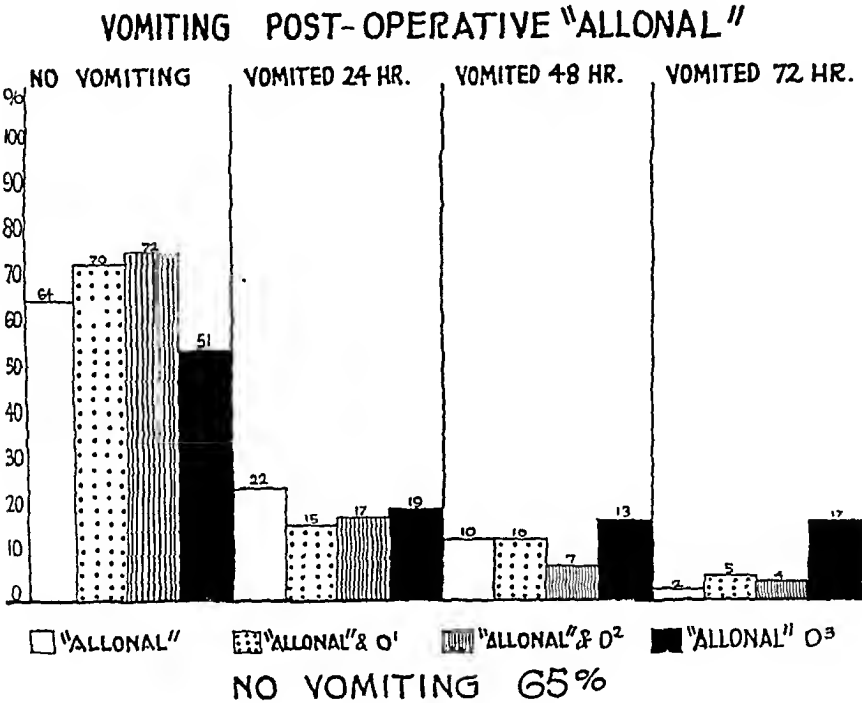


Fig. 1.

vomiting within twenty-four hours after operation to the anesthetic itself. While a few patients who received no opiates vomited on the second and third postoperative days, in no case was the vomiting severe nor did it require treatment. In the group with one hypodermic of narcotic (allonal O¹), lavage was done in 2 patients who vomited after the first day. Lavage was required 3 times in the "allonal O²" group, 2 of these patients having acute dilatation of the stomach and being distended; the third patient vomited several times but was not distended. In the "allonal O³" group, 9 patients were treated with lavage for marked vomiting; all had considerable distention. A consideration of the frequency of vomiting occurring after twenty-four hours, when presumably the effects of the anesthetic had worn off, shows that it was twice as frequent in the "allonal O³" group (30 per cent as in the other

three subgroups (12 per cent, 15 per cent, 11 per cent), yet the various operative procedures were practically identical in each group. While perhaps these differences are not striking, they must suggest that opiates played a part in the prolonged vomiting.

Distention.—Distention is a troublesome and possibly unavoidable concomitant of abdominal operations. The recognition of some factors which predispose to its development, namely, operative tissue trauma, cooling and drying of the intestines, traction of mesenteric supports, has developed the principles of sharp dissection, warm moist rubber dams to wall off intestines, and adequate exposure of the operative field. The frequency of distention is shown in Fig. 2.

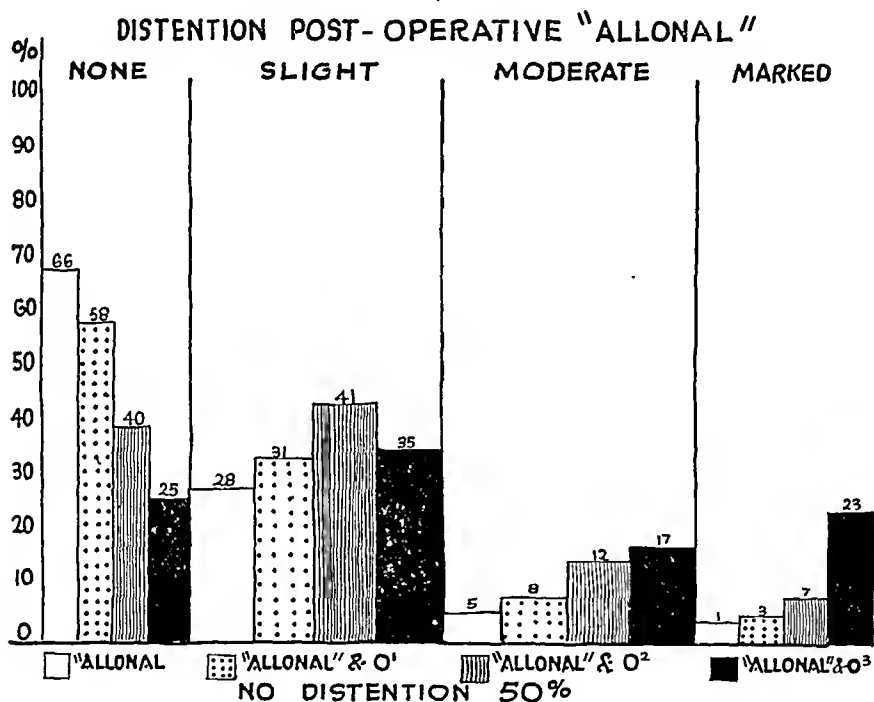


Fig. 2.

In the entire series, 50 per cent of the cases had no distention whatever and only 7 per cent had marked distention. In analyzing the subgroups, we find that two-thirds of the patients having allonal only, had no distention; but as the number of opiates increased, there were steadily fewer patients who were free from distention. Only 1 per cent of the women in the allonal (without opiates) group had marked distention; this incidence steadily rose in the other groups and was present in 23 per cent of the "allonal O³" division. These findings definitely indicate that opiates depress postoperative peristalsis and influence the frequency and degree of bowel atony after operation.

Until recently, medical progress has been so occupied with the application of biology, chemistry, and physics to the welfare of human beings

that the effect of the psychic influence upon organic function has been often overlooked. The current interest in "proper mental attitude" to the operative ordeal and the development of the "psychoanesthetists" suggests a readjustment of this attitude and an appreciation of the close interrelationship between the individual's organic and psychic determinants. Every surgeon realizes that the "recovery phase" of surgery may be a period of real stress and strain and amnesia, for events at this time would be a boon which by eliminating psychic trauma, would favorably influence the patient's recovery.

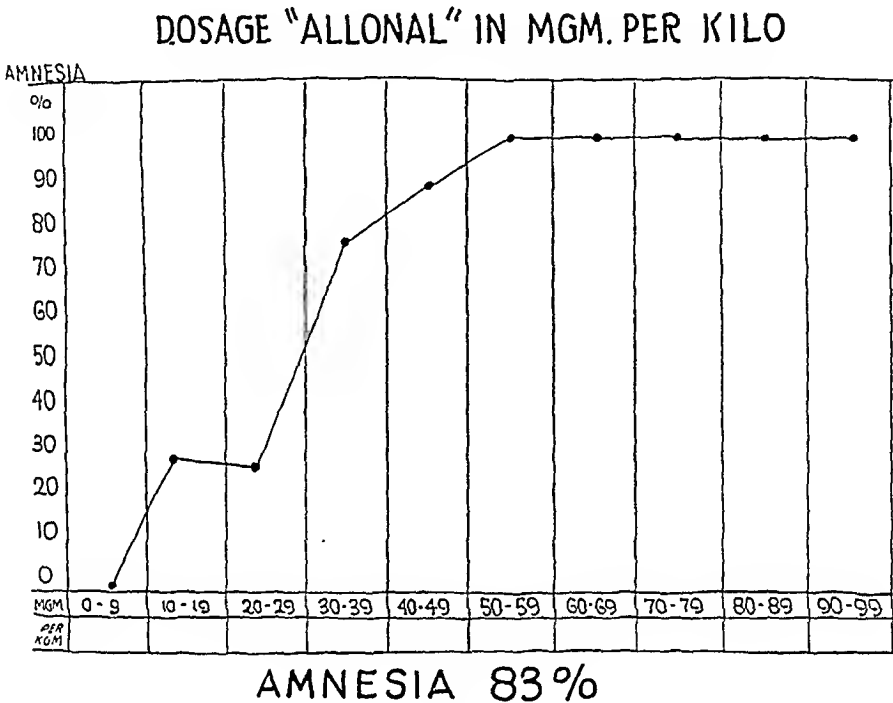


Fig. 3.

Allonal	144 cases	86.0% (128)
Allonal 0 ¹	77 cases	84.4% (65)
Allonal 0 ²	81 cases	82.7% (67)
Allonal 0 ³	79 cases	72.1% (57)
		<hr/> 83.3%

Amnesia.—The hypnosis following allonal strongly resembled a twilight sleep effect. While the patient was usually cooperative, appreciation of the time interval was entirely disorganized and the memory for events or pain was lost. After recovery from the hypnosis, it was often difficult to convince the patient that several days had elapsed since the operation, yet the evident relief when the situation was realized served as a valuable index of the degree of apprehension with which the operation and its sequelae had been approached. We consider that amnesia obtained by the barbiturates is a strong recommendation for their use.

Dosage.—Dosage was determined by body weight and is expressed in milligrams per kilo. The majority of the patients were in the third, fourth, and fifth decades, the youngest was twenty-three years, the oldest seventy years.

The range of dosage indicates the wide margin of safety of the preparation. With less than 30 mg. (total dosage per kilo) of the drug, amnesia followed in one quarter of the patients, which suggests inadequate dosage. Two hundred and sixteen patients (56.6 per cent) received between 40-50 mg. per kilo; quiet sleep followed in 73 per cent and amnesia in 83 per cent; therefore, we considered this the ideal dosage. While larger doses were followed by amnesia in every case,

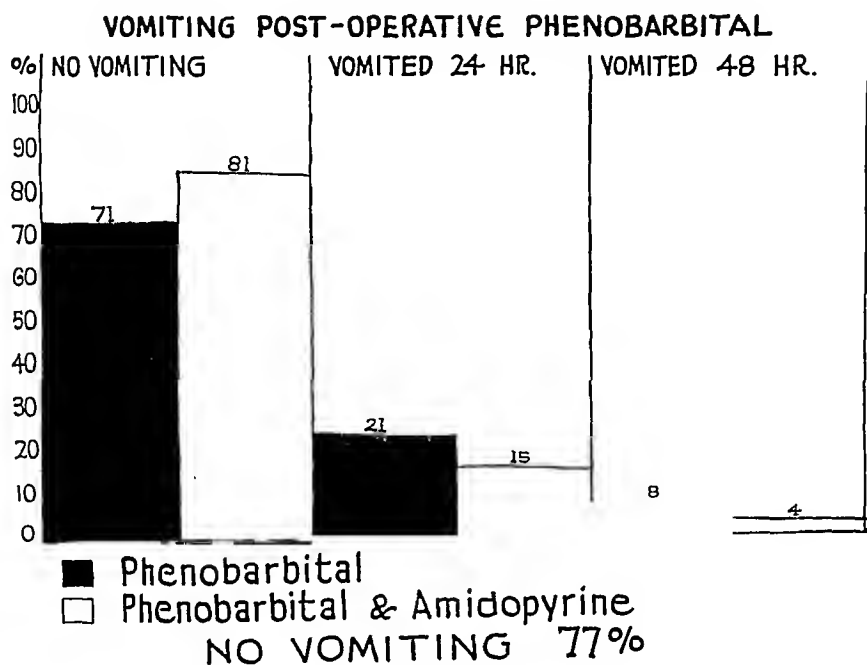


Fig. 4.

the incidence of excitement or delirium increased, probably being toxic manifestations from overdosage. These large doses were given during the early part of the study before we had any basis for comparison for dose standardization.

Although we were encouraged with the results obtained by allonal, we were also impressed with the validity of the criticism offered against a preparation in which the analgesic and hypnotic constituents were combined in fixed proportion; moreover, in such combinations, cumulative action of the more slowly eliminated agent (hypnotic) might lead to overconcentration and toxic manifestations. Unfortunately, the quantitative recovery of barbiturates in the urine is a time-consuming and rather technical procedure. Following the lead of investigations (Koppanyi and Lieberman) on the difference of rate of elimination of amido-

pyrine and barbiturates in animals, attention was now directed toward the clinical effects observed, following the use of barbiturates of simpler chemical formulas and amidopyrine; both agents being given separately and according to requirements. The reappearance of pain or sleeplessness was regarded as evidence that the analgesic or hypnotic element was of insufficient concentration in the tissues; presumably because of its elimination, and this indirect method served as an estimate of the relative rate of elimination of each drug.

A small group of women were given either barbital (veronal), phenobarbital (luminal), isoamylethyl barbituric acid (amytal) and amidopyrine postoperatively. The indication for either the hypnotic or analgesic

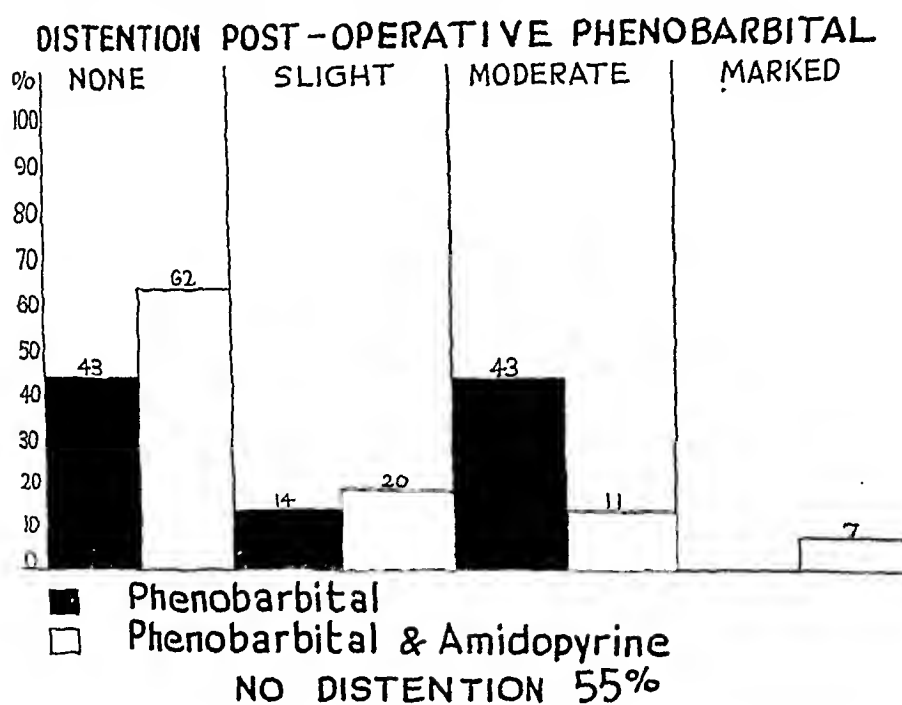


Fig. 5.

agent was determined by the presence of pain or sleeplessness and either or both were repeated according to these indications. Medication was by mouth, and, as in the allonal group, was begun as soon as nausea permitted. The anesthetic and postoperative care were the same as in the previous study.

TABLE III. PHENOBARBITAL—40 PATIENTS

Hysterectomy	28
Myomectomy	1
Salpingo-oophorectomy	4
Suspension	7

- I. Phenobarbital was used without an analgesic in 14 cases.
 II. Phenobarbital and amidopyrine were used in 26 cases.

In 4 (28 per cent) of the 14 patients who received the hypnotic without the analgesic, it was necessary to use opiates; in 3 of these women, the dose of phenobarbital was small and there was considerable pain, in the fourth there was excitement after a very large dose of the hypnotic. The one patient of this group who vomited for forty-eight hours had a dilated stomach; she had received opiates.

Opiates were used in 4 (15 per cent) of the 26 patients who received phenobarbital and amidopyrine; three times to relieve pain after inadequate dosage of analgesic and hypnotic, and once to control excitement from an overdosage. The one woman who vomited for forty-eight hours had had opiates.

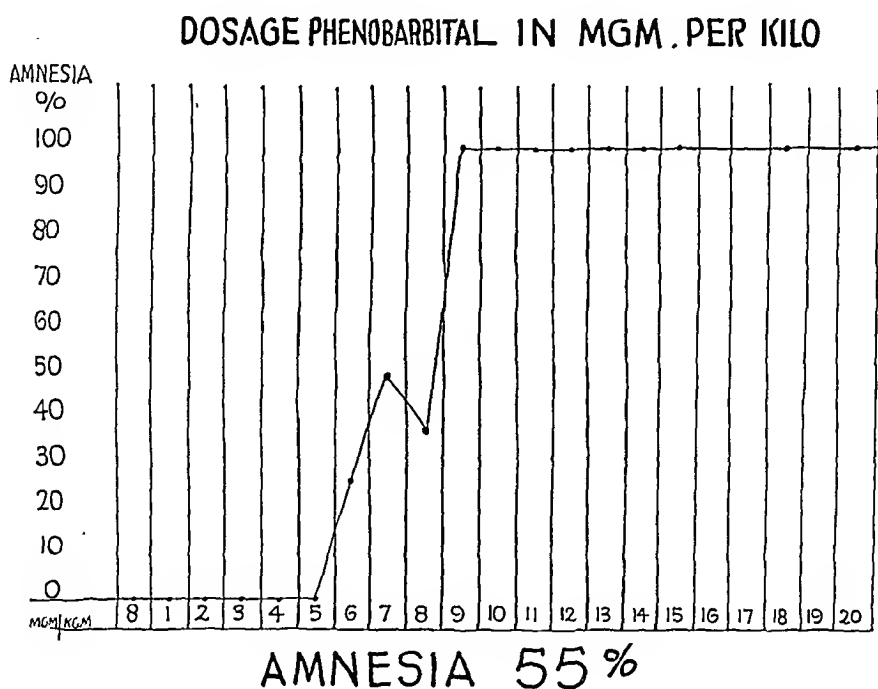


Fig. 6.

Six of the 9 patients having moderate distention received opiates, as did the 2 patients who had marked distention.

While this group of 40 patients is too small to warrant drawing conclusions, it would appear that the incidence of vomiting and distention was definitely increased by opium derivatives. (Fig. 6.) Amnesia occurred in 55 per cent of cases.

Phenobarbital in doses under 5 mg. per kilo was inadequate, required opiates, and was not followed by amnesia. Nine to ten mg. of phenobarbital seemed the proper dose, for quiet sleep and amnesia occurred in every case. Doses higher than 15 mg. per kilo, while followed by amnesia, were often accompanied by excitement. There were no complications that could be attributed to the medication, except skin rashes which occurred three times.

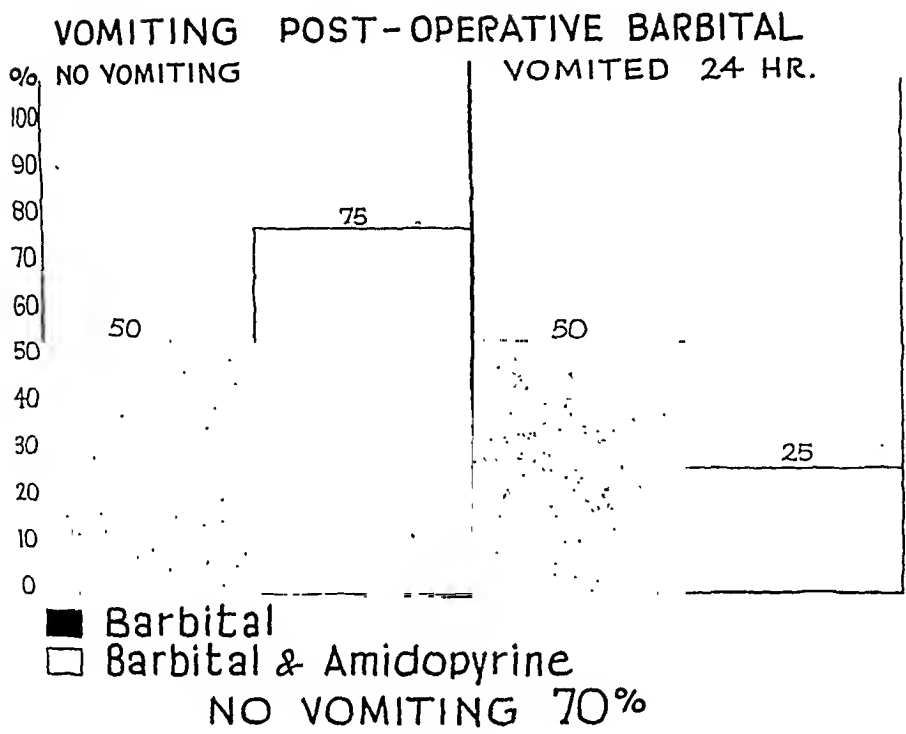


Fig. 7.

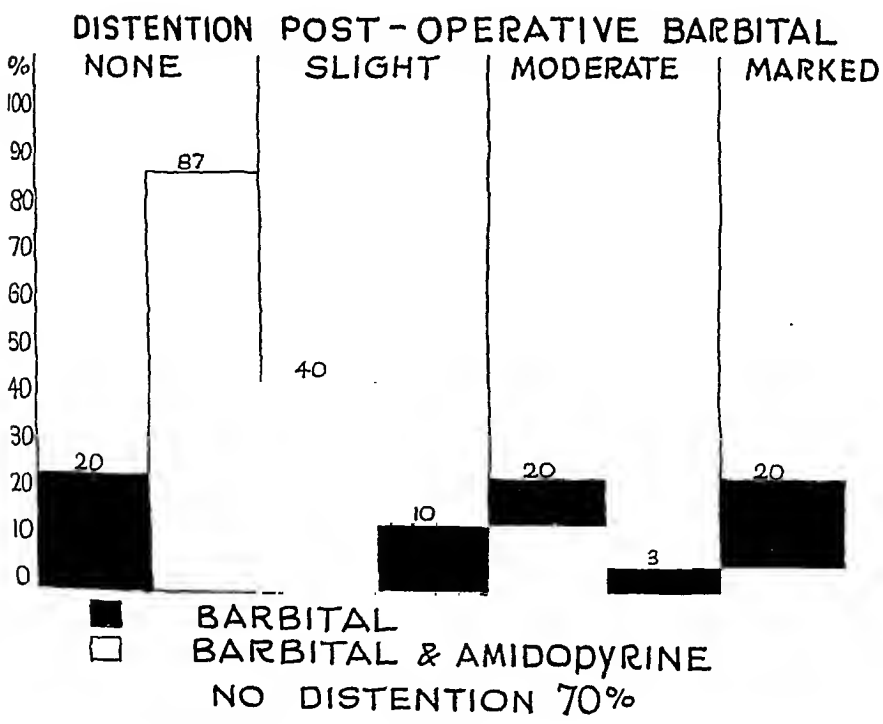


Fig. 8.

TABLE IV. BARBITAL—40 PATIENTS

Hysterectomy	23
Cesarean section (1 Porro)	3
Suspension	5
Salpingo-oophorectomy	9

In this group of cases, barbital and amidopyrine were given according to indications, as outlined in the previous section.

Barbital was used without an analgesic in 10 cases. Barbital was used in combination with amidopyrine in 30 cases.

Barbital alone after operation was not satisfactory and in all instances required supplementary opiates; there was no vomiting in 50 of the

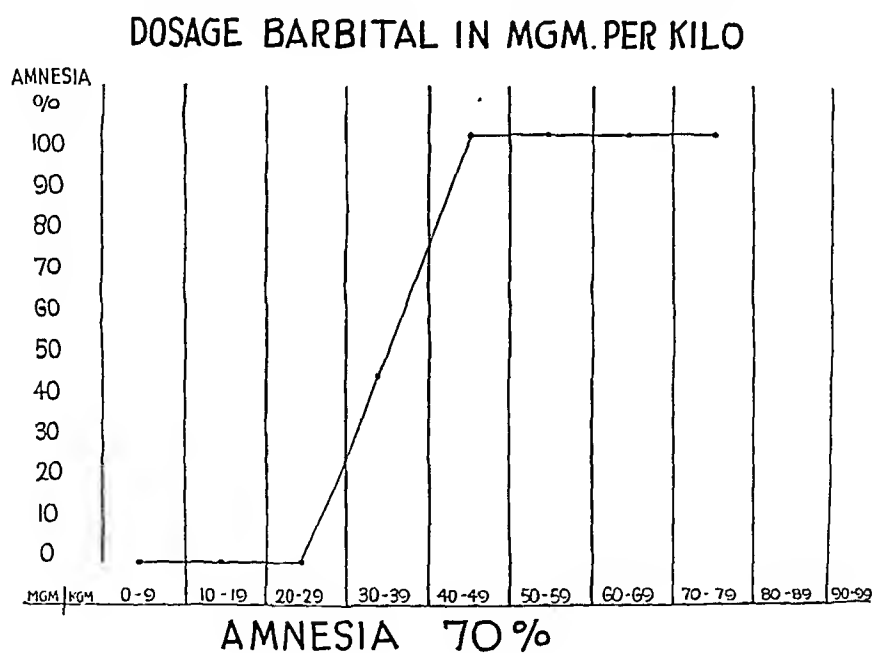


FIG. 9.

patients in this group. Barbital and amidopyrine were a most satisfactory combination, for there were no opiates required and there was no vomiting in 75 per cent of the patients. While the number of cases is small, the above data suggest the advantage of combining the hypnotic with an analgesic agent and indicate the disadvantage of using narcotics postoperatively.

There was no distention in 87 per cent of the cases having barbital and amidopyrine without opiates, whereas there was no distention in but 20 per cent of the patients who had barbital and opiates and in 20 per cent it was marked.

In 5 patients not included in this study, amidopyrine was used postoperatively without an hypnotic; it was found to be inadequate and required supplementary opiates.

Seventy per cent of the patients in this series had amnesia. Forty to fifty mg. of barbital per kilo were followed by quiet sleep and amnesia

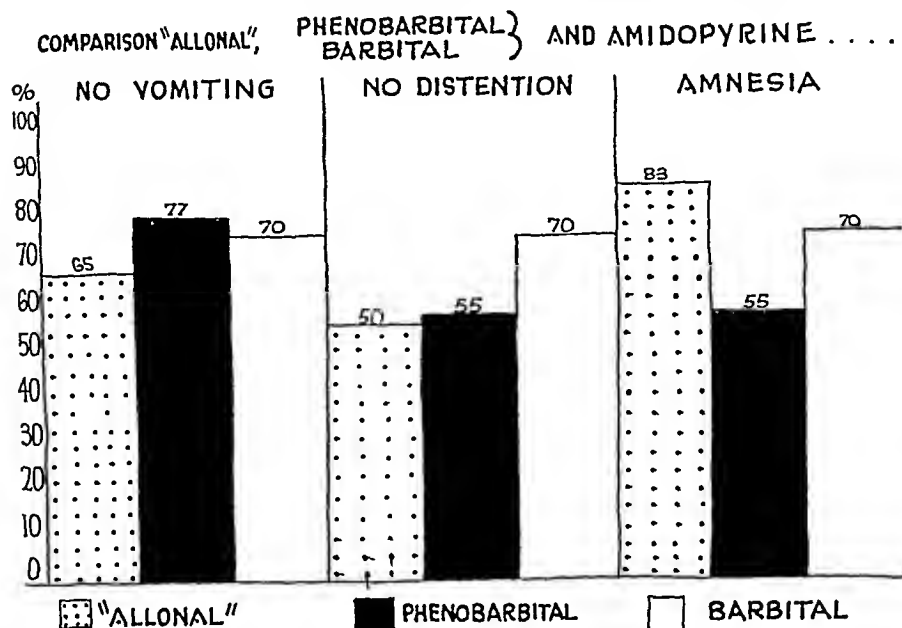


FIG. 10.

RATIO OF HYPNOTIC AND ANALGESIC AGENTS

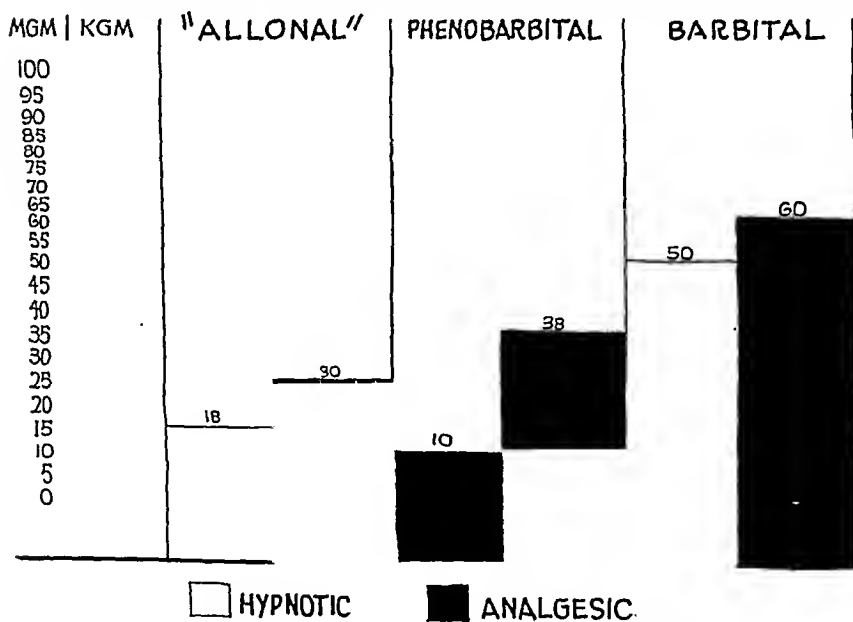


FIG. 11.

in all cases. Larger doses tended to cause delirium, while doses under 40 mg. per kilo did not invariably produce loss of memory.

In a group of 10 patients amytal was used postoperatively with amidopyrine.

Depression was more marked in all cases, and recovery from the hypnosis was more prolonged than with the other barbiturates. However, no conclusions can be drawn regarding the relative value of this hypnotic until further observations have been made.

Comparisons were made between the clinical effects obtained by the allyl-isopropyl barbituric acid combined in fixed proportion with amidopyrine (allonal), and barbital, phenobarbital, and amidopyrine given separately and according to indications.

Because of the difference in the number of cases included in the various groups, absolute conclusions cannot be drawn. However, it would seem that the hypnotic barbital given with amidopyrine when indicated, is a very effective combination. Moreover, because of its relatively simple chemical structure, barbital is definitely less toxic than the other modifications of malynol-urea and is unquestionably less expensive.

Total Dosage of Hypnotic.—The *ideal* dosages, as determined by our clinical results, were found to be from 40 to 50 mg. per kilo for allonal, from 9 to 10 mg. per kilo for phenobarbital, and from 40 to 50 mg. per kilo for barbital. The actual dose of hypnotic, however, in the allonal group was but 37.5 per cent of the total dosage, because of the fixed combination with amidopyrine. The coefficients of therapeutic efficiency in these modifications, therefore, are allonal from 15 to 18 mg. per kilo, phenobarbital from 9 to 10 mg. per kilo, and barbital from 40 to 50 mg. per kilo.

Total Dosage of Analgesic.—The amount of analgesic in the *ideal* dose of allonal was 25 to 31 mg. per kilo; whereas, when amidopyrine was given alone for clinical indications, the usual dosage was 38 mg. per kilo (range from 20 to 80) with phenobarbital, and 60 mg. (range from 20 to 120) with barbital.

DISCUSSION

To complete this investigation, detailed studies of phenolsulphonephthalein readings, blood pressure, blood plasma, carbon-dioxide tension, blood sugar, blood nonprotein nitrogen, and basal metabolic rate were made before and after operation in a group of 20 patients, 5 of whom had had allonal, phenobarbital, barbital, and amytal, respectively. There were no striking or constant changes noted in these preoperative and postoperative determinations, except in the basal metabolic rate which was definitely lowered postoperatively (general average 10 points) with each one of these preparations. Observations made at half-hour intervals for two hours after the administration of these drugs showed, as a rule, that the respiratory rate was slightly increased, but the blood pressure and the pulse rate were generally a little lowered. Reflexes were not disturbed. The urinary output in all cases was commensurate with the fluid intake. Traces of acetone were fairly common in daily urine examinations for the first few days after operation.

There were no postoperative complications that could be attributed to the medication, except for a transient drug dermatitis that occurred in 3 patients who had received phenobarbital. There was no mortality in the entire series.

In the group of women who received the hypnotic and analgesic according to clinical indications, the data suggested a considerable difference in the rate of eliminations of these agents. As a rule, the analgesic required repetition in from six to eight hours, whereas, after the hypnotic effect had once been established, further medication was not necessary, before a twelve- to fifteen-hour interval. This difference in elimination rate emphasized the rational of giving these preparations separately, and supports the therapeutic maxim of drug administration based solely on clinical indications.

We consider that barbituric acid hypnotics in this study were subjected to a most critical test, because of the well-recognized difficulties of oral therapy after a general anesthetic. Undoubtedly, our results would have been more strikingly satisfactory had the barbiturates been administered in solution hypodermically. Despite this handicap, however, we consider that the value of these hypnotics postoperatively has been definitely established.

CONCLUSIONS

Opium and its derivatives increase the frequency and severity of postoperative distention and vomiting, and are not necessary to relieve pain. Barbituric acid hypnotics are satisfactory from a pharmacologic and clinical standpoint when combined with an analgesic (amidopyrine). It is illogical to combine these agents in fixed proportion, because of the marked difference in their rate of elimination; it is rational to administer them separately according to clinical indications. Barbitol, by virtue of its simple chemical structure, is less toxic and clinically as effective as its more complex and toxic modifications.

We recommend these hypnotics because their action is limited to the central nervous system, their use is followed by a high incidence of amnesia and by little disturbance of organic function.

The author wishes to express her appreciation of the helpful suggestions offered by Dr. Chauncey D. Leake, Professor of Pharmacology, University of California Medical School.

REFERENCES

- Anderson, Chen, Leake:* J. Pharmacol. & Exper. Therap. 39: 272, 1930. *Van Noorden:* Therap. d. Gegenw. 52: 287, 1911. *Starkenstein:* Klin. Wchnschr. 4: 114, 1925. *Kaër and Loewe:* Arch. f. exper. Path. u. Pharmacol. 114: 339, 1926. *Koppanyi and Lieberman:* J. Pharmacol. & Exper. Therap. 39: 177, 1930.

PREVENTION AND REPAIR OF HERNIA IN LOW MEDIAN-LINE INCISIONS*

BY JAMES C. MASSON, M.D., ROCHESTER, MINN.

(From the Division of Surgery, The Mayo Clinic)

I HAVE come to the conclusion that incisional hernia occurs more frequently than most surgeons realize. From 1928 to 1930 operation was performed at The Mayo Clinic on 313 patients for this condition. Unless the hernia becomes enormous or causes distress the patients seldom complain. If patients are obese, hernia is likely to develop not only on account of the increased intraabdominal pressure, but because of the poor quality of the tissues that are brought together.

A predisposing cause of hernia in many cases is a previously infected wound, but hernia may develop in a low median-line scar in cases in which there has been no preceding infection. The cause of the hernia must be the type of incision, type of closure, care following operation, contraction of the abdominal muscles or increase in intraabdominal pressure. Fig. 1 shows the normal condition of the abdomen and the condition which commonly exists in women past middle age who have borne many children. If the abdominal wall is normal, there is little danger of later trouble, if ordinary care is taken in closing the incision, and if a complicating infection and increased intraabdominal pressure are not present. The patient should be kept in bed from ten to fourteen days. When marked diastasis recti abdominis is present and the abdominal wall is pendulous, however, special care must be taken. Approximation of the cut tissues is not enough as they are already stretched and have a relatively poor blood supply; even if healing takes place by primary union the scar that results will soon stretch into a wide weak line of union. In many cases, however, healing will not be satisfactory throughout the entire length of the wound and even when apparently infection or drainage has not occurred, some of the stitches will cut and a piece of omentum or a loop of bowel will enter the wound as the apex of a wedge and gradually spread the wound in the fascia. The peritoneum will gradually grow over the protruding viscus and a true hernia will result.

There is no doubt that in many radical operations for malignant conditions and in cases in which operation is absolutely necessary, the development of a weak line of union or hernia is of slight significance; the indication in such cases is to open the abdomen quickly, and, after the necessary operation, in the peritoneal cavity, to make as

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Virginia, May 18-20, 1931.

rapid a closure as possible even at the risk of hernia resulting, and the possible necessity of a secondary operation. Modern methods of operating and anesthesia, however, make the necessity for such incomplete operations relatively few, as practically any surgical procedure can be completed in an hour or the procedure can be changed so that operation may be completed in two or more stages, each of which will be relatively safe. The comparatively low mortality of the present time is probably due in a large measure to careful preoperative preparation, proper selection or proper combination of anesthetics and efficient postoperative care. Only a few years ago many patients died from pneumonia following operation; this rarely occurs now. On the gynecologic service at The Mayo Clinic there were 3,560 operations performed last year with only one death that might in any way be at-

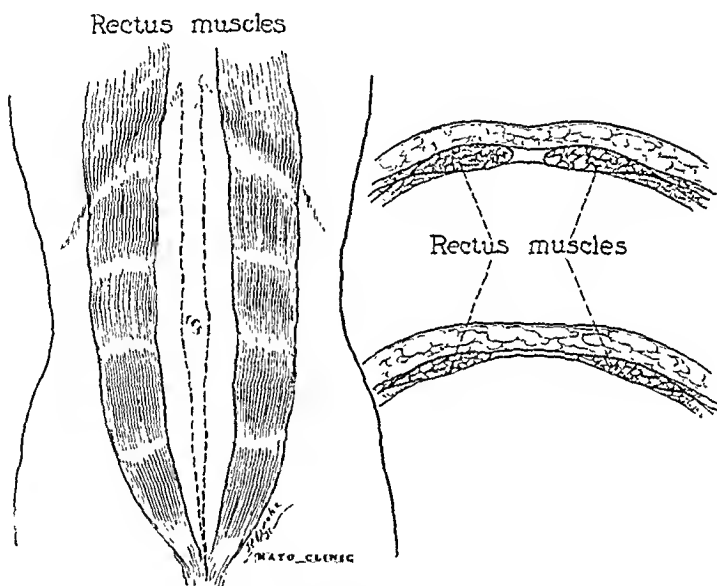


Fig. 1.—Normal rectus muscles and position of muscles in marked diastasis recti abdominis.

tributed to the anesthetic; in that case a spinal anesthetic of α -butyloxy-einehonine acid diethylene-diamidehydrochloride (mupercaine) was used. There is probably a field for the use of this drug when a long operation is indicated, but I am of the belief that it is more dangerous to use than any of the modern combinations of general anesthetics, spinal anesthetics, local infiltration, or regional block with procaine. When the hernia is large, spinal anesthesia is preferred. This, probably, is about the only operation in which spinal anesthesia is of advantage to both the surgeon and the patient. In many abdominal operations spinal anesthesia is of distinct advantage to the surgeon as it improves exposure, but the end-results in similar operations under a properly selected and properly given general anesthetic are as good if not better.

When making the incision, it is advisable to consider the type of closure, and I am sure that in some cases poor closure results from the fact that a busy surgeon frequently makes the incision thinking only of adequate exposure; after completing the major part of the operation he leaves the closure to an assistant who is anxious to get a reputation as a fast worker and, as a result, approximates the cut structures in a more or less anatomic manner, using relatively few stitches. This is satisfactory in most cases if one is dealing with a practically normal abdominal wall, but in the relaxed, thin wall, it invites or predisposes to postoperative hernia.

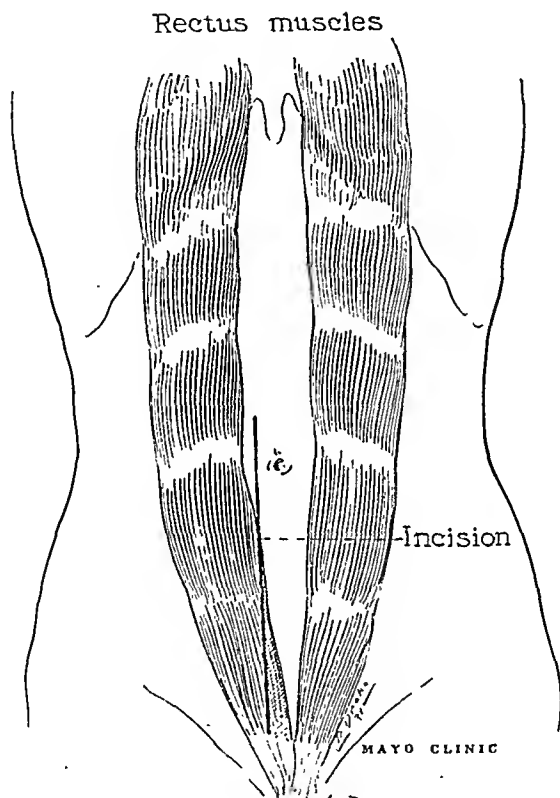


Fig. 2.—Poor type of incision, cutting edge of rectus muscle.

I believe that all incisions for exposure of the pelvis should be in the median line. A dangerous type of incision is one close to the median line through either the right or the left rectus muscle (Fig. 2). When such a wound is closed the narrow mesial strip of muscle has a definite tendency to atrophy, and a weak line of union results. In case the incision is carried above the umbilicus it is generally impossible to approximate the two recti muscles at this level. It is therefore advisable, either to remove the umbilicus or to cut it free from the fascia of the recti, and then to overlap the fascia for a short distance (Fig. 3). If diastasis recti abdominis is not marked the sheath of the rectus should be opened on each side to allow muscle to muscle approximation

and adequate exposure of the external sheath should be made to allow slight overlapping free from adipose tissue. It is much easier to do this before opening through the fascia than at the time of closure. The peritoneum varies a great deal in different cases, but is especially thin and friable if patients are obese. If possible, closure should be made with a running mattress suture and by eversion of the edges, but in many cases, especially if the muscles are not completely relaxed, it

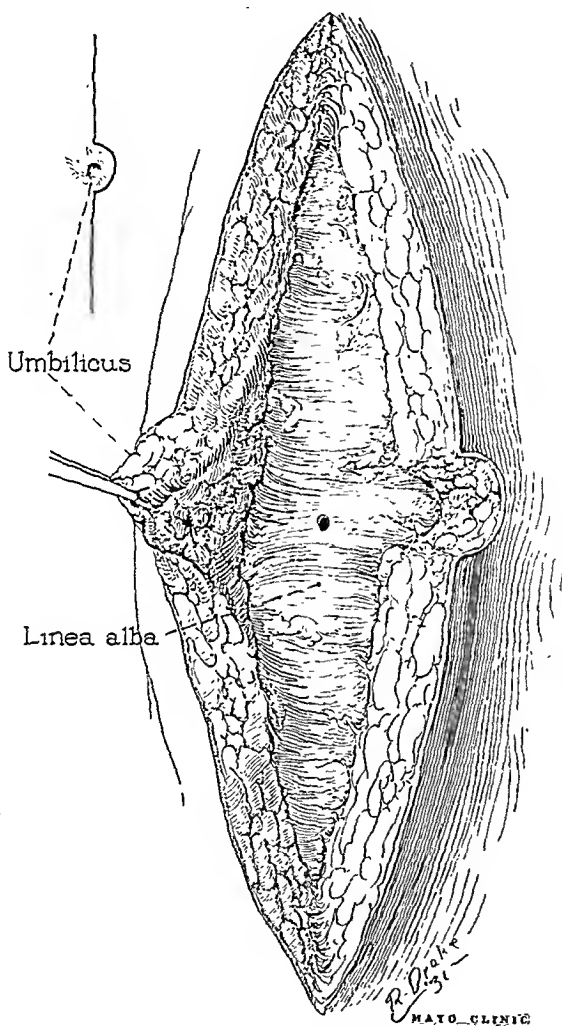


Fig. 3.—Incision extending above the umbilicus; the umbilicus is freed from the linea alba.

may be advisable to close the muscle and peritoneum together. If this is done it is not necessary to put separate stitches in the muscle but to make a good approximation, preferably overlapping the external sheaths of the recti. Tension sutures of nonabsorbable suture material are probably not necessary in the majority of cases, but I think it is wise to put three or four in every abdominal wound.

If patients are extremely obese with a large apron of fat in the abdominal wall, I have found it helps materially to make a large

transverse incision, excise considerable skin and subcutaneous tissue and then make the incision through the muscle in the median line. In this manner an abdominal retractor can be well placed in the muscle and the pelvis can be easily exposed (Fig. 4).

Many surgeons have been unfortunate enough to find an apparently aseptic wound without any sign of healing perhaps a week or more after operation, and when the superficial stitches are removed the edges of the skin separate and a loop of bowel presents itself. Such

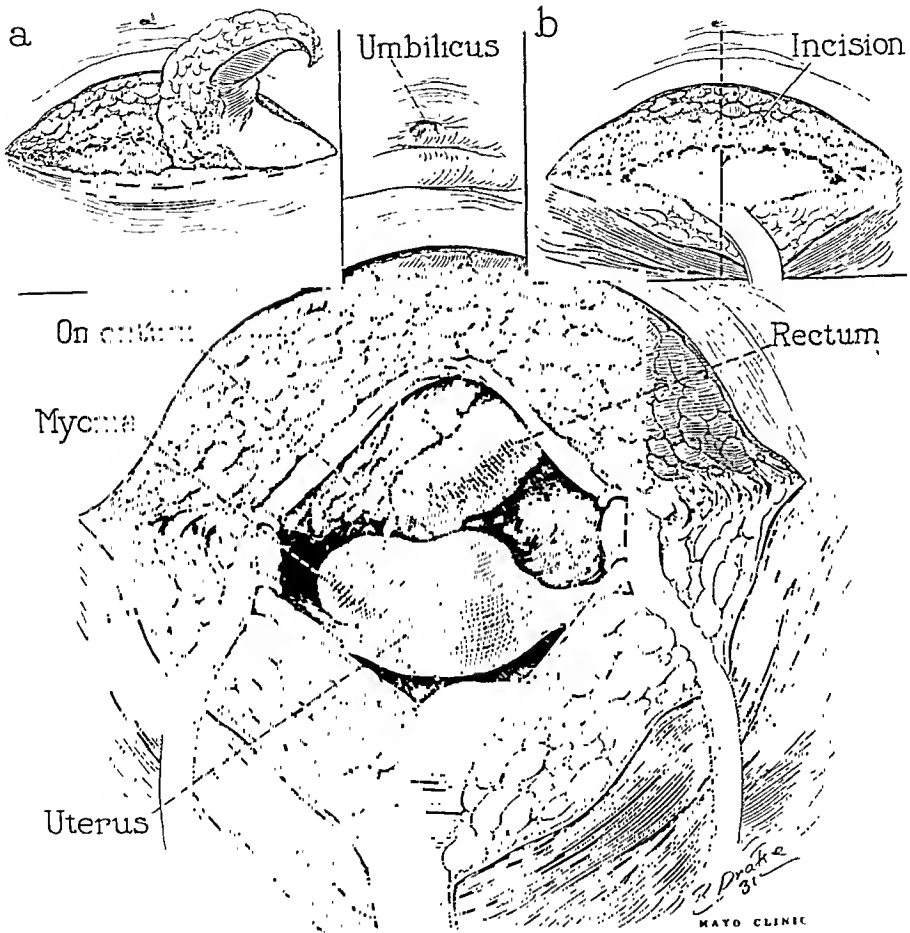


Fig. 4.—Lipectomy by means of transverse incision and median incision between the recti muscles and abdominal retractor on muscle edge.

hernias are caused, as Freeman suggested, by a piece of omentum that had been left protruding through the closure of the peritoneum when the wound was closed. It becomes swollen and edematous and a certain amount of fluid collects around it which flows along the wound, separating the approximated edges and preventing union. In other cases I believe union is delayed or prevented by a hematoma extending the entire length of the wound; when the catgut is absorbed the intraabdominal pressure is probably sufficient to open the entire

wound, especially if increased by complications such as distention, vomiting, use of stomach tube, coughing, hiccupping, attacks of sneezing, or difficulty in defecation or urination. It cannot be a question of poor healing, as some patients are in good general condition, and secondary closure heals perfectly in the usual length of time. There is no doubt in my mind that many hernias which are not discovered until months after an operation begin in the same manner; in such cases only a small hernia develops and the remainder of the wound heals normally.

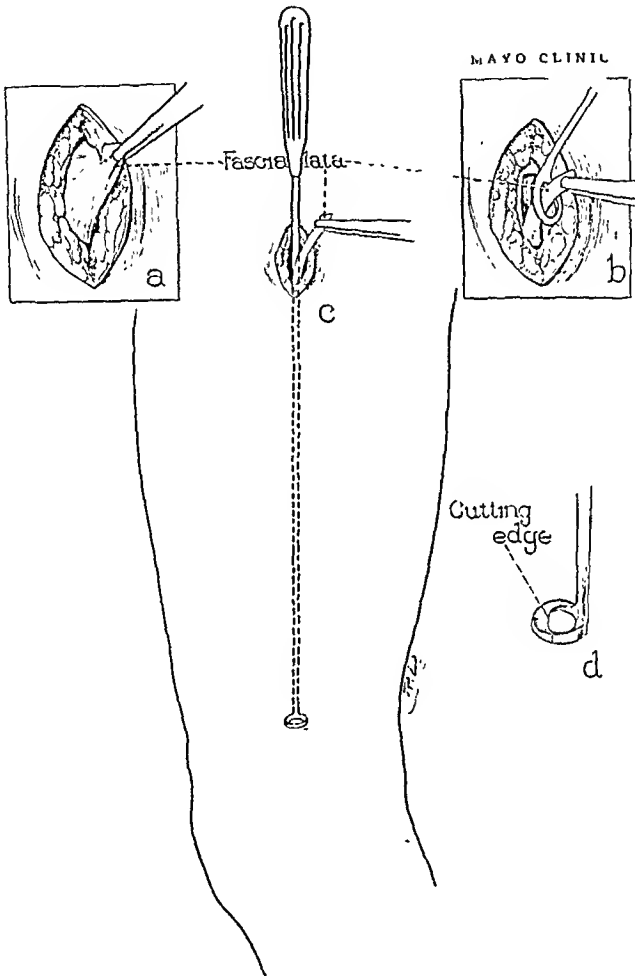


Fig. 5.—Method of obtaining living sutures from the fascia lata through a small incision.

If the hernia is small and situated about halfway between the umbilicus and the pubis, as a rule it will be possible to close the sac by much the same procedure as for an inguinal hernia. The fundus of the sac can be excised, the edges of the muscle thoroughly cleansed and brought together with mattress stitches of chromic catgut, and then an overlapping closure of the external sheath of the rectus can be made, also with the use of chromic catgut. If the opening is close

to the umbilicus, this type of closure will not be satisfactory as the recti muscles are likely to be widely separated and an overlapping closure is advisable. If the opening is small, it is best to make the closure from above down, but in most cases side-to-side overlapping is necessary.

If the opening is close to the pubis another difficulty is encountered, owing to the fixation of the recti muscles to the pubis, and if the hernia is the result of previous infection there is frequently considerable loss of muscular tissue. Freeing the rectus and pyramidalis muscles from the pubis on one side and approximating them to the other side has been advised, but I believe this is a dangerous procedure as it may be

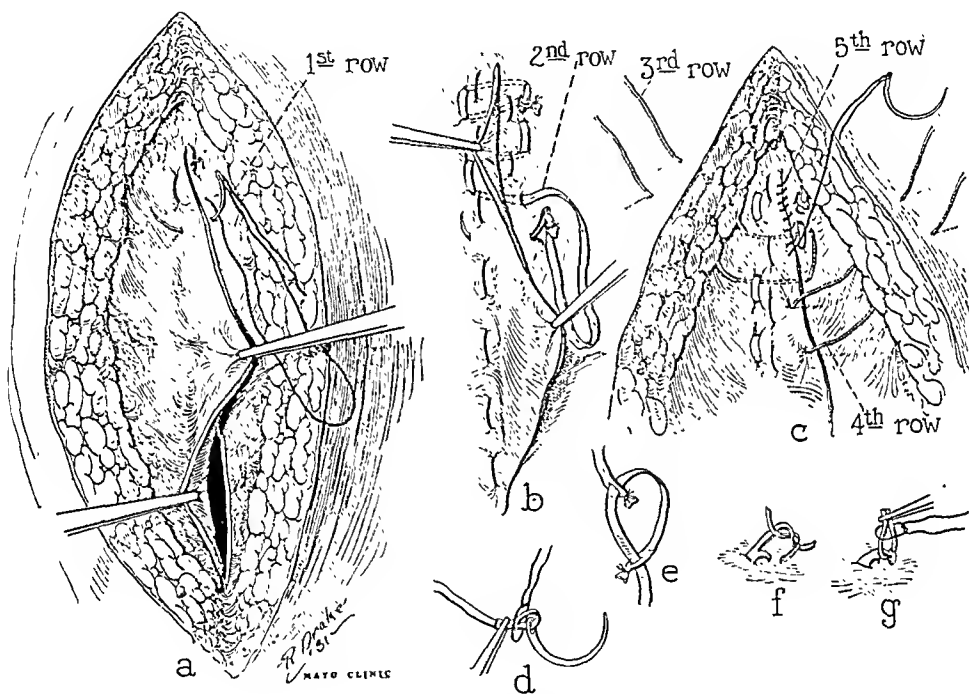


Fig. 6.—Closure of large hernias, a combination of plastic overlapping sutures and living sutures.

difficult to hold the cut end of the rectus down to the pubis and a weak wound may result. The procedure I have used for several years in such cases is to close such an opening with "living sutures" taken from the sheath of the rectus or from the fascia lata (Figs. 5 and 6).

In most cases the hernia extends throughout the length of the wound; in such cases I believe that the best results will be obtained by first thoroughly cleansing the sheath of the rectus of all areolar tissue, traumatizing or scarifying it on one side of the hernial opening for a distance of 2 to 2.5 cm., and excising the hernial sac; after separating any adhesions to the peritoneum for at least 2.5 cm. on each side of the wound, a plastic lateral overlapping closure of the Mayo type is used, bringing the cleansed peritoneum into accurate ap-

proximation to the cleansed scarified rectal sheath. If the separation is not excessive, such closure is satisfactory with the use of chromic catgut reinforced with several mattress stay sutures of silkworm-gut. In case the edges of the muscle are widely separated, however, such a closure is not satisfactory on account of the tension necessary to cause the edges to overlap; in such cases the use of several living sutures taken from the fascia lata as advised by Gallie is, to my mind, the greatest advance in hernial surgery in recent years. Strips of fascia can be obtained through a small incision in the upper part of the thigh by using the Mayo vein stripper to free them, and then a similar instrument with a cutting edge to free them at the lower end. I generally take a strip about 2 cm. wide and about 22 or 25 cm. long, and after removal cut it into three sutures each about 0.5 cm. wide. If more suture material is required, the process can be repeated, and in exceptional cases fascia can be taken from both thighs. The possible development of a muscle hernia in the thigh does not contraindicate the use of this method.

Reiprich: The Influence of the Male Sex Hormone on Female Sex Glands and Pregnancy. Arch. f. Gynäk. 136: 417, 1929.

The author transplanted testes from male dogs into 25 females and from male white mice into females in an effort to produce changes in the female generative sex organs and also in an attempt to terminate pregnancy in those females which were pregnant at the time of the experiments. He was able to produce a very definite hormonal sterilization and also to interrupt pregnancy if the latter was less than one half way toward full term. In those few cases in which sterilization did not result, the subsequent litters were reduced in numbers. There was no apparent effect upon the sex of the offspring. The author describes in detail the pathologic and anatomic changes resulting from his experiments. These consist chiefly in an ovarian atrophy with atresia of the ovarian follicles. He was unable to obtain similar results in any of his control experiments, or by the use of various commercial testicular extracts. The gonads apparently have an antagonistic action for each other.

RALPH A. REIS.

THE LENGTH OF LABOR*

BY L. A. CALKINS, M.D., Ph.D., KANSAS CITY, MISSOURI, J. C. LITZENBERG, M.D., MINNEAPOLIS, MINNESOTA, AND E. D. PLASS, M.D., IOWA CITY, IOWA

(From the Departments of Obstetrics and Gynecology of the University of Kansas, the University of Minnesota, and the University of Iowa)

IN THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY for February, 1930, there appeared an article on variation in the length of labor, in which a clinical analysis of 1,250 labors was made (Calkins). This published study was undertaken to determine what clinical factors had a bearing on the length of labor. Age and parity of the mother, as well as her height and weight, were studied. The height and weight of the child, the length of gestation, and the size of the mother's pelvis, as demonstrated by the length of the conjugata vera, were also included in the analysis. It was shown that, of all these clinical entities, parity alone had a bearing on the length of labor. Age of the mother, including the elderly primipara, was not found significant. Neither was the mother's height and weight important, thus contradicting the general belief that the fat woman is predisposed to a long, hard labor. The small pelvis, down to a size of 9.5 cm. for the conjugata vera, was not found to cause a prolongation of the labor. Large babies, up to ten and one-half pounds, did not produce a marked prolongation of parturition.

Parity alone had a definite effect on the length of labor, there being a marked decrease in the length of both the first and second stages of labor in secundipara as compared to the primipara. There was, however, no marked change in the length of labors after the second, when compared to the length of the second labor.

Inasmuch as that study covered a series of only 1,250 patients and was, therefore, not entirely conclusive, it was considered advisable to analyze a larger series in a similar manner. The present study includes some 3,030 cases from the obstetric services of the University of Minnesota, some 1,450 consecutive labors from the University of Virginia and the University of Kansas, and 1,250 patients from the Henry Ford Hospital, making a total of over 5,700. This group has the added advantage of including a considerable number of private patients, as well as a wide variety of nationalities from various parts of the country, and three separate types of techniques in the management of labor. It should, therefore, be a truly representative cross-section of the whole country and a series of 5,700 cases is sufficiently extensive to justify

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

rather definite conclusions as to the average length of labor and the various contributory clinical factors.

The simplest method of analysis, the average, was employed in this study. No other measure of variability or irregularity; such as within the range of distribution; will be included. The length of the first stage and the length of the second stage were analyzed separately. The effect of variation in age, in parity, in height of the mother, in weight of the mother, in length of gestation, in size of the pelvis, and in height and weight of the child, was determined with reference to each of the first two stages of labor. Occiput posterior presentation was contrasted with occiput anterior. No cases were excluded, save those where the clinical charts lacked the necessary data.

No attempt will be made in this presentation to compare our results with those of others recently published on various phases of this subject. Our method of analysis differs considerably but our conclusions are essentially in accord with the more recent articles.

AGE OF THE MOTHER

The primiparae were arranged in age groups at three-year intervals. The fifteen-year-old group included all patients fourteen, fifteen, and sixteen years of age; the eighteen-year group, those seventeen, eighteen, and nineteen years of age, while the forty-five-year group included all patients forty-four, forty-five, and over. The average duration of the first stage of labor was then determined in each age group. Fig. 1 (a) shows the result of these determinations. One hundred and two in the fifteen-year-old group showed an average duration of the first stage of labor of 13.2 hours, two-tenths of an hour more than the average for all primiparae. Six hundred and thirty-four cases in the eighteen-year-old group showed an average of thirteen hours, the same as the general average for the whole group. The line connecting the average for the fifteen-year group and the average for the eighteen-year group and projected on through the averages for the older age groups proves to be essentially a straight (solid) horizontal line. There is, therefore, no tendency for either increase or decrease in the first stage of labor, as we pass from the younger to the older age groups. There was not a sufficient number of cases to justify projecting this particular line beyond the thirty-nine-year-old group.

Multiparae arranged in similar age groups and with averages plotted in a similar manner showed the same general result. Whereas the plotted (broken) line is slightly irregular, there is no tendency for the average either to rise or to fall as one passes from the younger to the older groups of women.

Fig. 1 (b) shows a similar treatment for the second stage of labor. Multiparae present the same picture (broken line) as in the first stage. There is no tendency toward decrease or increase as one passes from the younger groups to the older. With the primiparae, on the other

hand, there seems to be a definite tendency toward an increase (solid line) in the length of the second stage as age increases. Primiparae of fifteen (87 cases) have a second stage twenty-eight minutes shorter than primiparae of thirty-three (61 cases) with the line of central tendency almost straight between these two average points.

It would seem safe to conclude that, whereas age has no effect on the length of the first stage of labor in either primiparae or multiparae nor on the length of the second stage of labor in multiparae, increasing age does slightly prolong the second stage of labor in primiparae. This effect is, at the most, a matter of a few minutes. Primiparae of fifteen have a second stage approximately ten minutes shorter than the

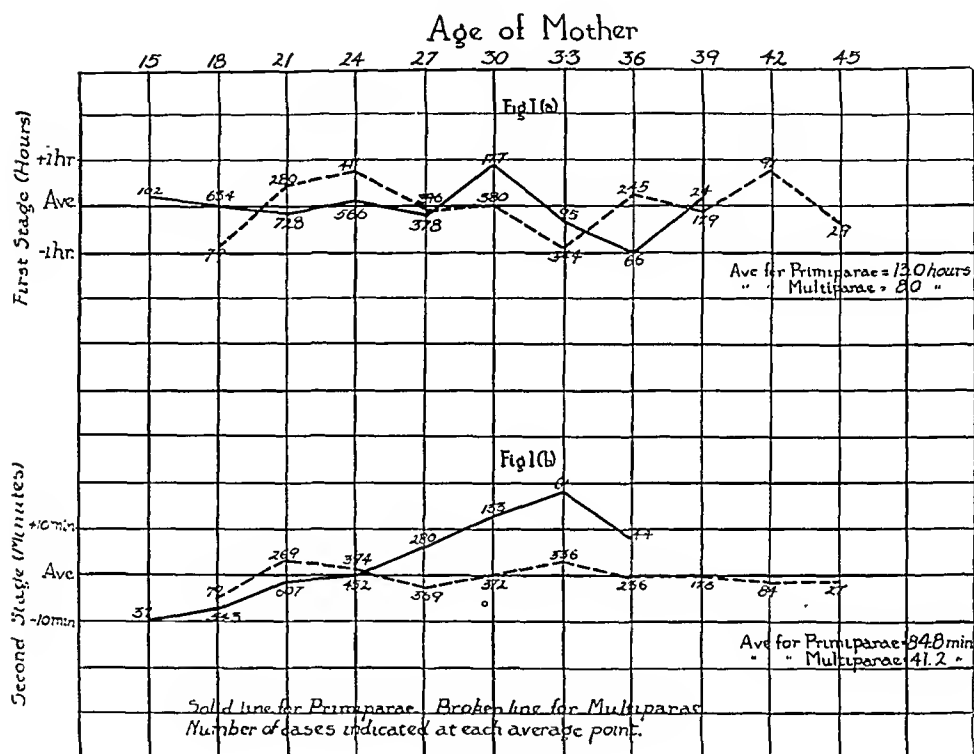


Fig. 1.

general average and primiparae of thirty-three have a second stage approximately seventeen minutes longer than the average. Contradictory to the generally accepted belief that elderly primiparae have long labors, it would seem reasonable to conclude from these figures that age has no considerable effect on either the first or second stage of labor, whether the patient be a primipara or a multipara.

PARITY

Fig. 2 (a) and Fig. 2 (b) are self-explanatory. In 2,791 primiparae there was a first stage average of 13 hours; 1,032 secundiparae had an average first stage of 8.2 hours, while 513 tertiparae had an average

of 7.3 hours. From the third labor onward there seemed to be a tendency toward a slight rise. Fifty-nine patients having their eighth labor showed an average of 9.1 hours for the first stage. Whether this increase is significant, as applied to the individual patient, is doubtful. The presence of scars or infection and hypertrophy in the cervix is probably more important than exact parity above three.

Fig. 2 (b) shows the duration of the second stage of labor developed in a similar manner. Here, again, we find a marked decrease from the 2,541 primiparae to the 1,003 secundiparae, amounting to thirty-three minutes. From the second labor onward, there seemed to be a slight

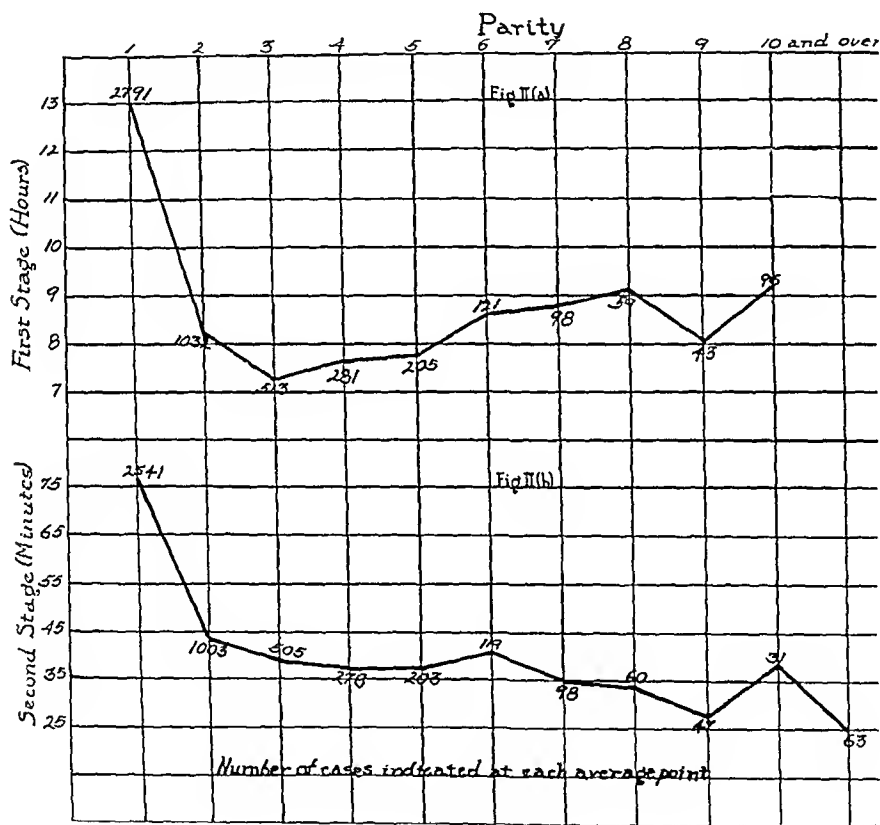


Fig. 2.

tendency toward decrease in each succeeding labor. However, the amount of this decrease would not be significant when applied to the individual patient.

Parity, then, has a very definite effect on the duration of both the first and second stages of labor. This effect, from a practical point of view, as applied to the individual patient, would seem to be confined to a difference between first and second labors. A multipara has an average first stage slightly more than 60 per cent of that of a primipara and an average second stage slightly less than 60 per cent that of a primipara.

HEIGHT AND WEIGHT OF THE MOTHER

Only a portion of the charts from the Minnesota Clinie and the Henry Ford Hospital showed records of height and weight of the mother, so that while considerable new data were available for this study, the additional information did not change the results obtained in the previous study and no further discussion will be attempted at this time. It is our present belief that neither height nor weight of the mother has any considerable influence on the length of labor. On account of the lack of a sufficient number of case records, we cannot definitely establish this as a fact at the present time.

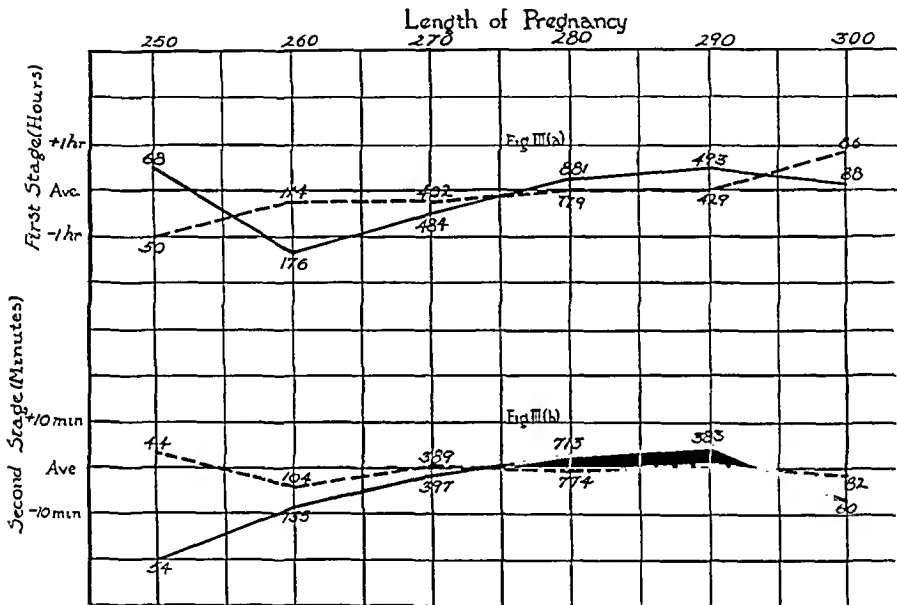


Fig. 3.

SIZE OF THE PELVIS

From the previous study, it seemed quite evident that size of the pelvis, as represented by the length of the true conjugate, did not have any bearing on the length of labor. (This statement applies to a conjugata vera of 10 to 13 cm. inclusive.) The additional data available at the present time have not served to alter this conclusion.

LENGTH OF THE PREGNANCY

The length of gestation, as measured by the menstrual history and divided into ten-day intervals from 250 to 300 days inclusive, when analyzed, produced the results shown in Fig. 3 (a) and Fig. 3 (b). In the multipara the length of pregnancy has no effect on the duration of labor. In the primipara it would seem that the longer pregnancies produce a very slight increase in both the first and second stages of labor. A pregnancy of 290 days required about an hour and a half

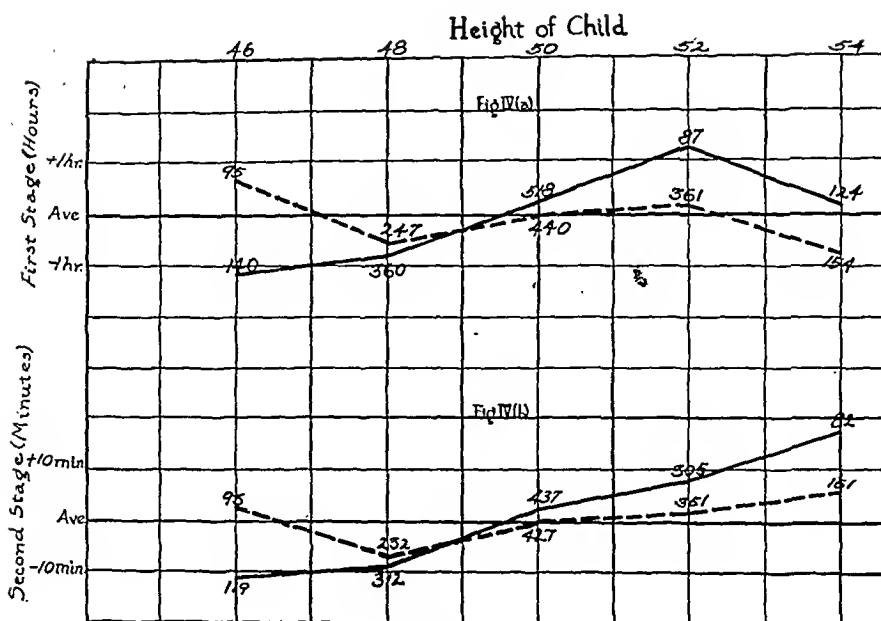


Fig. 4.

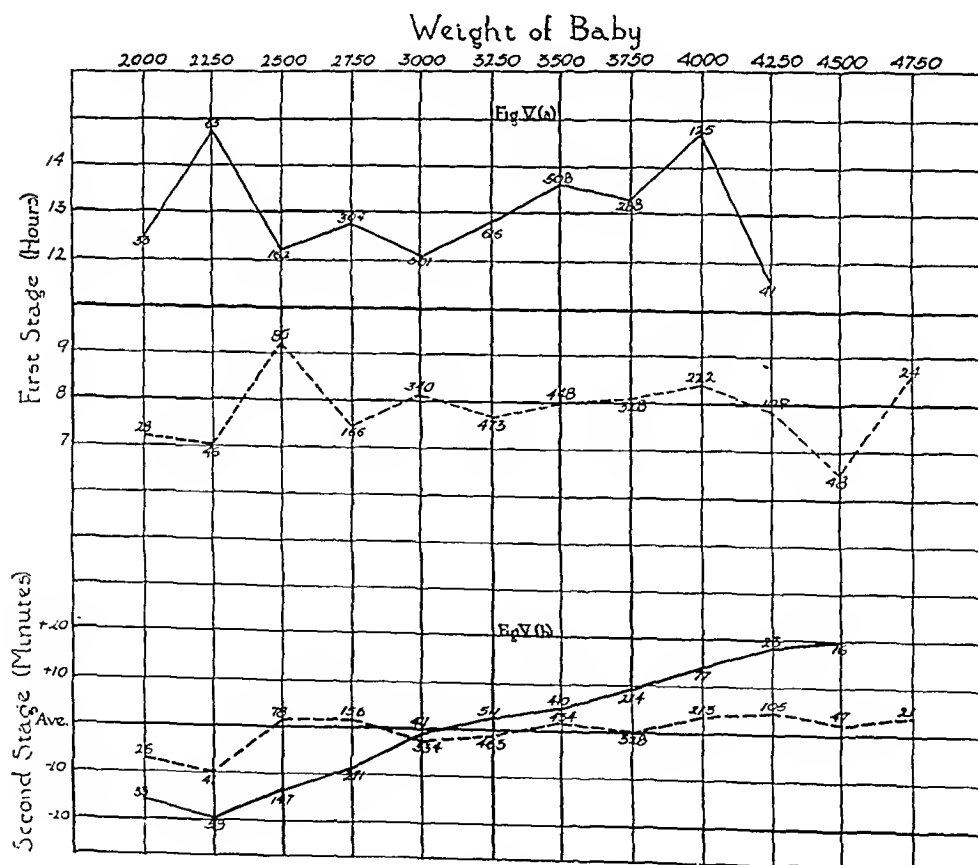


Fig. 5.

longer for complete dilatation than a pregnancy of 260 days. In the second stage, thirteen minutes more were required, on the average, for a pregnancy of 290 days than for one of 260 days. These differences are the result of averages in a large series of cases and are not of sufficient size to be of importance in the care of the individual patient. It is doubtful whether a study of the length of pregnancy for its effect upon the length of labor, can be considered very conclusive without a correction being applied for the coincident increase in size of the baby. As will be shown in the next section, the length of both the first and the second stages of labor in primiparae is increased proportionately with the size of the baby. This increase is more marked than that shown on Fig. 3. On this basis it might be concluded that length of pregnancy alone has no effect on the duration of either the first or the second stage of labor.

HEIGHT AND WEIGHT OF THE BABY

A study of the height of the baby (46 to 54 cm. inclusive) and weight of the baby (2000 to 4750 grams inclusive) revealed results as indicated in Figs. 4 and 5. For multiparae there is no increase in either the first or second stages of labor as one passes from small to large babies. In primiparae there is a considerable tendency toward prolongation of both the first and second stages when the babies are large. There is a difference in the first stage of nearly two hours between 48 and 52 cm. babies and between 3000 and 4000 gram babies. In the second stage there is a difference of about seventeen minutes between 48 and 52 cm. babies, and about twenty-five minutes between 2500 and 4000 gram babies. These differences would seem to be sufficiently significant to be applied to the individual patient in making up our judgment as to the progress of the labor.

PRESENTATION AND POSITION

The influence of presentation upon the duration of labor is shown in Table I. Occiput anterior, occiput posterior, and breech presentations are included. There were not sufficient numbers of the other types of presentation to justify computing averages.

TABLE I

	FIRST STAGE (HR.)	SECOND STAGE (MIN.)
<i>Primiparae</i>		
Occiput anterior	12.4 (2017 cases)	83 (1706 cases)
Occiput posterior	14.9 (630 cases)	95 (437 cases)
Breech	13.1 (95 cases)	-----
<i>Multiparae</i>		
Occiput anterior	8.2 (1837 cases)	40 (1758 cases)
Occiput posterior	9.2 (466 cases)	44 (440 cases)
Breech	9.1 (99 cases)	-----

From Table I it is apparent that occiput posterior results in a somewhat longer labor than breech presentation. It causes an increase over

occiput anterior, in the first stage of about two and one-half hours in primiparae and one hour in multiparae. In the second stage, occiput posterior delays delivery by twelve minutes for primiparae and four minutes for multiparae. A more frequent reiteration of the fact that labor is longer in occiput posterior than in occiput anterior might well serve as a potent factor in increasing our equanimity in the management of this presentation.

DISCUSSION

To summarize, it would appear that no one of the clinical factors studied affects the length of either the first or the second stage of labor in multiparae, except presentation. Occiput posterior results in an increase of about one hour in the first stage and four minutes in the second stage in multiparae.

In primiparae, a number of factors seem to have some influence on the duration of the labor. The exact effect of these factors, singly and in combination, is shown in Tables II and III.

TABLE II. LENGTH OF THE FIRST STAGE IN PRIMIPARAE

GENERAL AVERAGE IN 2769 CASES		15.0 HOURS
<i>Increased by</i>		
Large baby (3750 grams and over)	503 cases	15.3 hours
Occiput posterior	702 cases	16.9 hours
Large baby and occiput posterior	138 cases	18.6 hours
<i>Decreased by</i>		
Small baby (2000 to 2750 grams)	610 cases	14.7 hours
Occiput anterior	2082 cases	14.6 hours
Small baby and occiput posterior	446 cases	14.6 hours

TABLE III. LENGTH OF SECOND STAGE IN PRIMIPARAE

GENERAL AVERAGE IN 2394 CASES		109 MINUTES
<i>Increased by</i>		
Elderly mother (30 years and over)	295 cases	118 minutes
Occiput posterior	512 cases	119 minutes
Large baby (3750 grams and over)	410 cases	120 minutes
Occiput posterior and large baby	99 cases	149 minutes
Occiput posterior and elderly mother	43 cases	149 minutes
Large baby and elderly mother	37 cases	154 minutes
Occiput posterior, large baby, and elderly mother	10 cases	178 minutes
<i>Decreased by</i>		
Occiput anterior	1895 cases	107 minutes
Young mother (19 and under)	701 cases	102 minutes
Small baby (2000 to 2750 grams)	549 cases	98 minutes
Occiput anterior and young mother	482 cases	97 minutes
Small baby and young mother	156 cases	94 minutes
Occiput anterior and small baby	413 cases	92 minutes
Occiput anterior, small baby, and young mother	126 cases	92 minutes

From these tables, the extreme variation in the averages of the first stage of labor is four hours. Occiput anterior and a small baby has an average duration of 14.6 hours as compared to occiput posterior and a large baby where the average duration is 18.6 hours. The extreme variation in the averages for the second stage of labor is from 92

minutes for occiput anterior, small baby, and young mother, to 178 minutes for occiput posterior, large baby, and elderly mother. The gradations between these extreme averages for both the first and second stages in primiparae, are approximately what one would expect from the consideration of the various factors present in each group of cases.

The fact that of all the factors studied, presentation alone has a bearing on the duration of labor in multiparae and the fact that the various factors influencing the length of labor in primiparae have a comparatively small effect would seem to indicate that the most im-

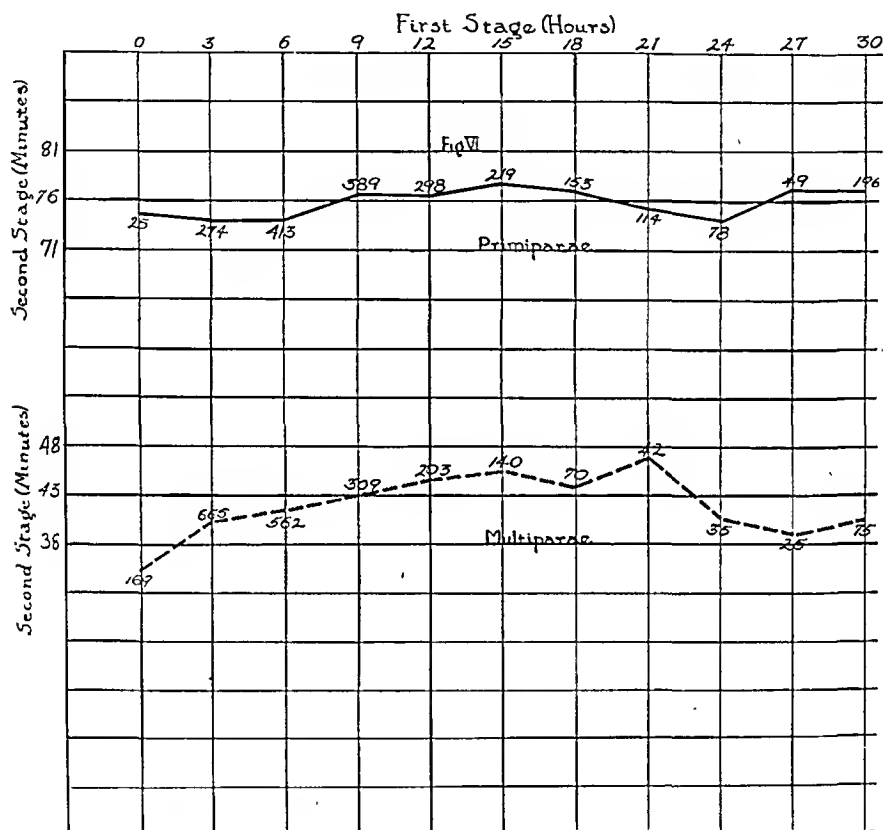


Fig. 6.

portant elements influencing the length of labor have not been included in this study.

It is generally believed that the relative (total) amount of amniotic fluid and the size of the bag of forewaters, as well as the time of its rupture, are matters of some importance in determining the length of labor. Close observation of a long series of cases would seem to indicate that this belief is sound; yet it does not seem that the membranes play any considerable rôle when applied to the whole group. One will encounter patients whose labors proceed quite rapidly following premature rupture of the membranes. Perhaps more often, one will encounter those whose labors are apparently prolonged on that account.

The resistance of the soft parts, particularly the cervix, is, beyond question, a factor of great importance in determining the length of the first stage of labor. The resistance of the pelvic floor, and occasionally of the vaginal walls in the primiparae, is also a factor of importance in determining the length of the second stage. Frequency, duration, and intensity of the uterine contractions are perhaps more important than any other factors in determining the length of labor.

A comparison of the duration of the first stage with the duration of the second (Fig. 6) reveals the interesting fact that in primiparae there is no connection between the duration of the first stage and that of the second stage. Two hundred and seventy-four patients with a first stage of from two to four hours had the same average duration for the second stage (seventy-three minutes) as that of 78 patients whose first stage was from twenty-three to twenty-five hours. In multiparae there seems to be a slight relation between the length of the first stage and the length of the second stage. Six hundred and sixty-five multiparae with a first stage of two to four hours had an average second stage of thirty-eight minutes, whereas 140 with a first stage of fourteen to sixteen hours had an average second stage of forty-eight minutes. Might we infer: 1. That in multiparae the labor pain is the most important item in determining the duration of the labor? 2. That in primiparae the resistance of the cervix and of the pelvic floor, along with presentation, size of the baby, and the age of the mother, is of almost equal importance with the character of the labor pains in determining the duration of labor? Clinical observation affords considerable evidence in favor of these inferences. Scar tissue, or infection and hypertrophy, in the cervix of the multipara retards dilatation a very little, in the presence of strong pains. A rather firm and resistant cervix in the primipara, on the other hand, materially delays the progress of labor, even though the labor pains be strong. Resistance of the pelvic floor is a much more important item in the primipara than in the multipara. Considering the labor pains alone, without regard to the resistances present, one frequently sees quite marked variations between first stage pains and second stage pains. This is particularly true in primiparae. Not infrequently, poor and ineffective first stage pains are succeeded by weaker contractions at or about the time the head reaches the pelvic floor, accounting for a large fraction of our low forceps deliveries. This may be due to a resistant pelvic floor in a patient whose cervix has dilated readily, but more commonly it is due to an actual weakening of the labor pains.

From Fig. 6 it is quite evident that in multiparae, accurate diagnosis and judgment of the progress of the first stage of labor will allow us to predict the probable duration of the second stage. In primiparae, on the other hand, the length of the second stage bears no relationship

to the length of the first stage. We must, therefore, reexamine our patient after complete dilatation and reconsider the forces and resistances involved before we can prognosticate the probable duration of the second stage.

SUMMARY AND CONCLUSIONS

From these inferences and the foregoing facts, it would seem that a more accurate observation of the *resistance* of the cervix (and the pelvic floor); as well as a more accurate determination of the *effectiveness* of the labor pains, will be necessary in order to analyze the causes for the extreme variations in the length of labor so commonly encountered. More accurate determination of the resistance would likewise enable us to predetermine the probable duration of the labor. Deliberate appraisal of the various factors present in any given labor, when balanced against a more definite knowledge of the *forces present and functioning*, might also serve to reduce our present high rate of operative interference.

To this end, it is suggested that the *consistency of the cervix*, as well as the thickness of its wall and the length of its canal, be *accurately determined and recorded* before labor begins or as early in labor as possible. Such a record on a scale of five (one being a very soft cervix, three, one of average softness, and five, a firm resistant cervix) has been kept on a few hundred cases with surprisingly satisfactory results. It is suggested that the *effectiveness of labor pains* be more accurately *determined and recorded* for the purpose of increasing our ability to determine the probable length of labor in each given case. Experience with a small series thus estimated on a scale of five (with one and two representing poor pains, three average pains, four hard pains, and five abnormally hard pains), has proved very suggestive. In the grading of labor pains, more attention is paid to the intensity of the contraction than to duration or frequency, although all three factors must be given consideration. Intensity of first stage contractions can be satisfactorily estimated by digital (not palmar) palpation of the fundus or by palpation of the tension, and amount of stretching, produced in the cervix. It is believed that digital palpation of the fundus (not the lower uterine segment) is more accurate than palpation of the cervix. Likewise, in the second stage, digital palpation of the fundus is preferred to the determination of the amount of descent or the amount of stretching of the pelvic floor.

It is believed that accurate determination of the effectiveness of the labor pain balanced against the resistance of the cervix and pelvic floor, is the all-important factor in determining the length of labor. The other variants, as analyzed in this study, are of only minor importance.

THE TREATMENT OF THE VERTEX OCCIPITO- POSTERIOR POSITION*

BY ARTHUR H. BILL, M.D., CLEVELAND, OHIO

(Professor of Obstetrics and Gynecology, Western Reserve University)

IN PRESENTING another paper concerning the much-discussed vertex occipitoposterior position I am prompted by the realization that this complication still causes those who practice obstetrics more trouble than any other. By this, of course, I do not mean that it is the most serious complication, but because of the frequency of its occurrence, it is a very common source of annoyance. Numerous articles in the recent literature do not indicate that the problem of managing labors complicated by this abnormality has reached a solution at all satisfactory. I have never considered the occipitoposterior as a complication difficult to overcome and, therefore, my thoughts are directed toward the real cause of difficulty. Is the fact that the posterior position continues to be a serious problem, due to unsatisfactory methods of delivery with a lack of standardization or is it due to an unsound policy as to the question of interference on the one hand and watchful waiting on the other? Probably both factors are to blame. As important as is the proper selection of methods of delivery, perhaps of equal importance is the determination of the proper time during labor at which delivery should be accomplished. It seems to me that the teaching of the management of this complication is most confusing to the practitioner both as regards the general policy and in respect to the delivery methods used. There are two methods of procedure which are perhaps equally faulty. One is that of too early interference, that is in the first stage of labor, and the other is that of too long waiting for spontaneous rotation after full dilatation of the os has been accomplished. I would suggest a modification of the general teaching that the waiting policy is the safer one and urge that this policy apply only to the first stage of labor. In my opinion the general teaching that in most of these cases the head will rotate spontaneously and that therefore the treatment should be expectant, has been one of the greatest factors in the continuance of a too high fetal mortality rate. The teaching, that the place at which the head should normally rotate is on the pelvic floor, has also been responsible for too great delay in interference and consequently unsatisfactory results. In many cases the head will reach the pelvic floor only after an inexcusably prolonged second stage of labor which has worked to the detriment of both

*Read at the Fifty-Sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

mother and child and in other cases the head will not reach the pelvic floor at all, while in the posterior position. The idea that the pelvic floor is the proper place for rotation has also led to the faulty method sometimes advocated of drawing the head down to the pelvic floor with forceps and then rotating. The traction force necessary to bring a fetal head down to the pelvic floor while in a posterior position is so far in excess of that required to accomplish the same thing when the occiput is anterior, that it can never be considered justifiable.

I look upon the persistent posterior position as a distinct abnormality which should be treated as such by proper interference early in the second stage of labor. To expect the forces of the uterus and abdominal muscles directed toward the pelvis and in a line with the child's body, to produce a rotary movement of the fetal head sufficient to turn it 135 degrees is scientifically unsound. Much of the force so expended is wasted, the result being unnecessary fatigue of the mother and harmful pressure on the child's head. Statistics all show that fetal mortality rises as the length of second stage labor increases.

Ideal results must not be judged by the fact of eventual spontaneous rotation of the head but by the condition of the child at birth and the conservation of the mother's strength. Furthermore, in those cases in which the posterior position is persistent and interference is eventually resorted to, the delivery may be very much more difficult because of the undue prolongation of the second stage. Many very difficult deliveries would have been easier deliveries if earlier interference had been the policy. For example, if the head remains high and the elective procedure is delivery by podalic version the ideal time to perform the version is while the contractile activity of the uterus is such that it will relax under an anesthetic and before there is developed a tonic state of contraction, or even a contraction ring. Too long delay sometimes makes the performance of this elective procedure impossible and necessitates the use of either the more dangerous high forceps or even the performance of a cesarean section. In my opinion cesarean section needs seldom if ever be performed because of the occipitoposterior position. In the series of cases which I shall report none of the cesarean sections included in the list were performed because of the posterior position but because of a contracted pelvis, the diagnosis of the occipitoposterior position being merely incidental to the case. Practically the only indication for cesarean section referable to the posterior position is that of dystocia due to the cervix, which is more common in posterior positions than in anterior positions. The example of this is the occasional case in which with very little dilatation the fetal heart shows signs of irregularity and calls for interference of some kind.

The policy which I have followed throughout my entire practice and which I advocate to trained obstetricians may seem radical but I

personally have become more and more convinced of its soundness with each succeeding year of practice. In this connection I should like to make it perfectly clear that this policy is recommended for those trained in obstetrics and is not a compromise of ideals to suit the methods which are within the resources of physicians unfamiliar with obstetric procedures and without the background sufficient to supply the judgment essential for proper application of methods. I fear that such a compromise of ideals has to a considerable extent retarded the adoption of successful procedures and unfavorably modified the teaching of obstetrics. This comment would apply, however, to more phases of obstetrics than the occipitoposterior position. The methods which I advocate in this paper are, however, those which are taught to our residents in training and satisfactorily carried out by them. The experience, therefore, which I and my associates at the Cleveland Maternity Hospital have had in the treatment of occipitoposterior positions is such as to amply justify our satisfaction with the methods used. The policy is that of extreme conservatism and watchful waiting in the first stage of labor combined with one of active interference at the beginning of the second stage. In the first stage of labor noninterference is the watchword and with this is intimately bound the relief of pain. The first stage is ordinarily somewhat prolonged, sometimes very markedly so, and therefore where methods for the relief of pain have not been used, the prolonged suffering of the patient has in many cases induced the physician to interfere before the complete dilatation of the cervix. In my opinion attempts at delivery before the termination of the first stage of labor have resulted in higher fetal mortality than that due to contraction of the bony pelvis. Where pains of labor are relieved and sufficient time allowed, spontaneous dilatation of the os will ordinarily result. Manual dilatation of the os should be used only in cases of emergency usually due to a failing fetal heart. The necessity of such a procedure, however, is not often seen.

Inasmuch as the satisfactory conduct of the first stage of labor depends to a large extent upon the relief of pain, I shall mention briefly the common methods which we use for this purpose. In primiparae morphine and scopolamine analgesia is used to a stage three hours before the expected birth of the child. When pains become harder this is supplemented for complete relief, by inhalation analgesia, gradually increasing to anesthesia. In some cases colonic ether is given between the scopolamine stage and that of anesthesia. This variation depends somewhat upon the length of the first stage. In cases of multiparae, sodium amytal is the routine administration followed by either colonic ether and then anesthesia or by inhalation analgesia and anesthesia. The general anesthetics used for delivery are ether, and nitrous oxide and oxygen. The choice between the two depends largely upon whether

one desires complete relaxation of the uterus as in the case of a version; or, prefers less relaxation as in the case of a forceps delivery. A certain amount of dilatation of the os is not deemed essential as an index of the time to start analgesia. The fact that the patient has pains which hurt her is sufficient regardless of dilatation.

In the dry labor with the fetal head high and in the posterior position, progress is occasionally so slow that there is a real danger of fetal distress before sufficient dilatation may be accomplished. In some of these cases it is better to insert a bag and promote more progressive dilatation, though this is by no means a common necessity. As mentioned before, an occasional case of this type may require cesarean section. In the series of cases reported in this paper, cesarean section was not performed for this reason though in one case it probably should have been.

While the first stage of labor may be considered one of watchful waiting and the relief of pain, that is, nature's stage, the management of the second stage of labor is surely the physician's problem and the labor has then reached a point when with proper delivery methods used early he may obtain uniformly good results. I believe that by careful observation an obstetrician should be able to determine very early in the second stage whether spontaneous rotation will occur promptly, or whether if at all only after many additional hours of labor. It seems to me that one hour of second stage labor should be sufficient for such a test. Personally I do not wait at all for spontaneous rotation after the os has become fully dilated. The common belief that in a primipara the fetal head should be engaged at least two weeks before the onset of labor needs considerable modification in the cases of posterior positions. In a very considerable percentage of these cases the fetal head is unengaged at the time of the onset of labor and still remains unengaged at the beginning of the second stage. It is impossible to make these heads fit into the pelvic brim by pressure and were it not for the diagnosis of a posterior position there might be a decision to perform a cesarean section. However, in such a case the head when rotated to an anterior position or when delivered as an after-coming head, after podalic version, may be made to pass through the pelvic brim with ease. Undoubtedly a good many cesarean sections are performed in cases of this type when the fact of the high head is not due to the pelvic dystocia but is due merely to the faulty position. To expect the fetal head to be forced through the pelvic brim in such an unnatural position by the prolonged action of the forces of labor; by stimulation of the uterine muscle by drugs; or by the application of an extremely tight abdominal binder; or to pull the head through the pelvic inlet with forceps while in a posterior position, would seem to be the height of folly. After full dilatation the faulty

position should be corrected without further delay. The patient may be saved further labor and the baby delivered with uniformly good results by the proper procedures.

My selection of methods for delivery in vertex occipitoposterior position was influenced to a large extent by two things. First, a decision not to use the high forceps operation except in extreme emergencies; and, second, never to deliver the head in the posterior position, nor to make any traction upon a head while still in the posterior position with the idea of bringing it down to a lower pelvic plane. Thus, when a decision to deliver a patient is made, the abnormality of position is corrected first of all and before any attempt at delivery is made.

I have reduced the procedures used to two; internal podalic version, followed by immediate extraction; and, rotation of the head by forceps according to what has been termed the "modified Scanzoni" maneuver, followed by forceps extraction. Following the principle of the disuse of the high forceps operation, whenever the largest diameter of the fetal head has not passed through the pelvic inlet, internal podalic version is performed as the procedure of choice. When the largest diameter of the fetal head has passed through the pelvic inlet and the head is in the pelvic cavity, forceps delivery is performed. I personally never attempt manual rotation of the head nor rotation of the body of the child by intrauterine manipulation. It seems to me that the intrauterine manipulation necessary to accomplish this is as great as the manipulation necessary to perform a version and after it is accomplished one still has the problem of the delivery of the child to face. When the head is in the pelvic cavity and manual rotation is attempted, the head is commonly displaced to a considerably higher level so that after the rotation one has to deal with a high head instead of one which is well down in the pelvis. The head is also undoubtedly more likely to rotate back to the posterior position after manual rotation than after forceps rotation.

When forceps rotation of the head is performed the head remains practically in the same pelvic plane throughout the rotation and descends to a certain extent immediately upon completion of the rotation, being then in a lower pelvic plane for the subsequent delivery.

Some question has been raised as to just what the "modified Scanzoni maneuver" is. I personally have claimed very little credit for this procedure as an original operation. However, as slight as the modification may seem to be, it is to my mind, of the utmost importance for the success of the maneuver. The only element of modification of this procedure which I have stressed is that while rotating the head, instead of performing rotation and traction at the same time, producing thereby a spiral movement of the head and causing descent during rotation, the head is rotated in the pelvic plane in which it lies with no traction whatever. The misleading statement has been

made that I push the head up before rotating. I never deliberately do this but have said that sometimes during rotation if the head seems to be too well fixed in the pelvis, a very slight upward pressure may facilitate the rotation. Usually even this is not done. The following are the important steps in the technic of the forceps delivery of the occipitoposterior position, each one of which is important for the success of the procedure:

First: There should be complete dilation of the os.

Second: The fetal head should be in the pelvic cavity.

Third: The membranes should be ruptured or are artificially ruptured before the application of the forceps.

Fourth: Thorough manual dilation of the whole birth canal below the head is performed so as to eliminate as far as possible resistance to the head in the course of the subsequent delivery. This, however, has nothing to do with the rotation. Episiotomy is performed only in cases of unusual rigidity in which sufficient dilatation cannot be accomplished by the ironing out process; or, in cases in which due to a failing fetal heart, it is wise to eliminate all possible resistance and hasten the birth.

Fifth: A cephalic application of the forceps is made with the concavity of the blades looking forward; that is, toward the baby's face.

Sixth: Before locking the forceps the handles are depressed somewhat so as to bring the blades of the forceps more nearly in the long diameter of the ovoid which has as its poles the vertex and the chin. This is advisable inasmuch as there is, as a rule, in these cases poor flexion of the head.

Seventh: The forceps are locked and the handles are raised toward the opposite groin of the patient. This maneuver has a tendency to favor flexion of the head.

Eighth: Without any traction the handles are then carried around in a large circle so that during the various stages of rotation they point first toward the groin of the patient; next, toward the thigh; and, next almost downward toward the floor. With this sweep of the handles the blades of the forceps do not deviate from the same axis during the process of rotation and the fetal head turns with them with the use of very little force on the part of the operator.

Ninth: The rotation is continued until the occiput lies directly under the symphysis pubis and the sagittal suture is in the anteroposterior diameter of the pelvis. The extent of this rotation is important in preventing a return of the head to its original position after the forceps are removed. When the head is rotated merely to the oblique diameter there is greater likelihood of its becoming posterior again when the forceps are removed.

Tenth: Before the forceps are removed some traction is made, with no idea of delivering the head, but simply enough to fix it in its new position. If the patient is under complete anesthesia at this time, the anesthetic is now taken off so as to favor uterine contractions which tend to further fix the head in this position, before the forceps are removed. The forceps are then removed and re-applied as to any normal anterior position.

Eleventh: In the reapplication of the forceps there are certain points which are important to observe and which have to do with the prevention of the return of the head to a posterior position, an experience which has bothered many who have tried this procedure. These are:

a. The posterior blade should always be applied first. For example if the case has been one of right occipitoposterior the right blade is put on first. After this blade is inserted there is little or no chance of the head turning back during the application of the anterior blade.

b. The posterior blade should be inserted with as little manipulation as possible. If before inserting this first blade, the physician is too intent upon digital examination of the sutures and fontanelles and in doing so pushes the head upward it will very likely slip back into its old position. But if the blade is applied promptly and with little or no disturbance of the head this will not occur. After the blades are applied to the head in its new anterior position a check should be made to see that the most perfect cephalic application is had. The best test of this is that the anterior edges of the blades should lie parallel to and equidistant from the lambdoid sutures. If this condition is present, one always has an ideal cephalic application.

Twelfth: Traction is then made coincident with the contractions of the uterus so as to diminish as far as possible the necessity of traction force. An axis traction appliance is always used because it is thought that the increased accuracy in the direction of traction thus obtained, tends to further diminish the force required, in other words, to eliminate wasted force. When the head is brought down to where it is well fixed in the vulvar orifice, the forceps are removed and the head is shelled out manually. The rotation of the head is accomplished more easily with a forceps having a pelvic curve. There is no need of a straight forceps. I use the Tucker-McLane solid blade forceps with axis traction appliance and believe that it is by far the most satisfactory instrument for this work.

This entire procedure contrary to frequent statements is a thoroughly safe and invariably successful procedure. It is a gentle manipulation in no part of which is any amount of force used, and when carried out according to the technic described offers practically no danger of injuring either the mother or the baby. To my mind it is far superior to any other forceps operation for the delivery of the occipitoposterior head which has ever been suggested. It is a thoroughly scientific procedure in that it first of all corrects the abnormality of position and nothing more, and leaves the delivery to be treated as that of a perfectly normal anterior position. If the head is in a position of partial rotation, that is, of transverse arrest, one application of the forceps is sufficient. This also should be a cephalic application by which rotation is completed.

When the head remains high and the largest diameter has not passed through the pelvic brim, internal podalic version is probably the more satisfactory procedure, not that rotation cannot be accomplished perfectly well by the forceps when the head is high but that the subsequent delivery after rotation would be that of a high forceps. If after full dilatation of the os the head is still high and in a posterior position and the membranes are intact, the method of rupturing the membranes and waiting for spontaneous rotation is not without danger for if rotation and descent do not occur, and version is then deemed the operation of choice, it is naturally a more difficult procedure. Inasmuch as in my practice podalic version is the procedure of choice under such conditions and inasmuch as we know that podalic version is more easily performed before the membranes have ruptured, I follow the principle of performing the delivery promptly and while ideal conditions

exist. Such a version is in reality a prophylactic version. If the membranes have already ruptured and at the time of the full dilatation of the os the head is still high, the more promptly the version is performed the more certain will one be of a successful termination of labor.

The technic of internal podalic version and breech extraction has been so thoroughly described by Irving Potter that further comment would seem unnecessary. I should like to point out, however, those steps in the procedure which seem to be the most essential for a smooth delivery and satisfactory result. These are:

First: A thorough dilatation of the entire birth canal.

Second: Use a relaxing anesthetic so that there will be no tendency for the uterus to contract during the course of the version.

Third: Use a long rubber glove.

Fourth: If the membranes are intact, retain all fluid possible by rupturing them, near the location of the feet.

Fifth: Attempt to determine the location of the cord and prevent if possible the occurrence, during the subsequent extraction, of a straddled cord which might make considerable trouble.

Sixth: Bring down both feet together with the heels to the front.

Seventh: During the extraction of the buttocks make no attempt to keep the sacrum of the child toward the front for it invariably turns into a sacroposterior position during its descent through the pelvis.

Eighth: After the buttocks are delivered, favor anterior rotation so as to bring the back of the child to an anterior position.

Ninth: Deliver the shoulders by a twisting and downward movement of the body which rotates the anterior shoulder under the pubic arch and tends to sweep the arm of the child toward the chest. Sometimes the entire arm will come out with this procedure and sometimes the arm will lie across the child's chest but still in the pelvic cavity from which point it may be easily picked out by one finger hooked in the bend of the elbow. The second arm is also brought out as an anterior arm by turning the child's body in the opposite direction and duplicating the former procedure.

Tenth: If the head is still high, be sure that it does not lie in the antero-posterior diameter of the inlet. To attempt to deliver the head in this position might be disastrous. I therefore lay great stress upon the principle of always making sure that the child's head lies in the oblique diameter of the inlet before any attempt at delivery is made.

Eleventh: Do not use the Mauriceau grasp on the child's shoulders but with the finger of the internal hand in the child's mouth, which serves more to aid flexion than anything else, deliver by pressure with the other hand above the symphysis and upon the child's head. I find it rarely necessary to use forceps upon the after-coming head.

As to the results which we have obtained at the Cleveland Maternity Hospital by following the general policy and methods of delivery which I have described I shall quote two groups of statistics. First, I would refer you to an article upon this subject appearing in the *Journal of the American Medical Association*, under date of May 9,

1931, by Samuel M. Dodek, at present Research Fellow in Obstetrics at Western Reserve University.

In this article, Dodek reports a series of cases of occipitoposterior position in which labor had been conducted and delivery accomplished by the Resident Staff. You will note that the Residents had a tendency to wait a little longer in some of these cases than is my own practice. However, the same general policy was followed and the same methods used. Of the cases allowed to remain in the second stage for longer than the usual time "only 26 per cent rotated spontaneously, and of these 5 were in the second stage over three hours; 5 for four hours; 4 for five hours or more; 3 for six hours; and one for seven hours." This will illustrate the futility of waiting in the second stage.

In this series there were 514 cases, in which the head rotated spontaneously in 148 cases. Fifty-nine were delivered by internal podalic version; 276 by the modified Scanzoni maneuver and 12 after manual rotation. There were 18 cesarean sections in this series but in these cases the posterior position did not furnish the indication for cesarean section. As to the details of this series I refer you to Dodek's paper, but merely note here that in the entire series the fetal mortality was 4.47 per cent for all babies, and that excepting fetal deaths due to conditions which had nothing to do with labor, such as prematurity, monsters macerated fetuses, etc., the corrected labor and delivery mortality for the child was 3.1 per cent.

In addition to this series I have analyzed the last 500 consecutive cases of vertex occipitoposterior positions which I personally delivered. In this series no cases of spontaneous rotation of the head are included, the head being in the posterior position in each case at the time of delivery.

There were 219 primiparae and 281 multiparae in this series, as follows:

Para	i	219 cases
	ii	161 cases
	iii	70 cases
	iv	31 cases
	v	12 cases
	vi	5 cases
	vii	1 case
	viii	1 case
Total		500 cases

In all of these cases labor was conducted practically painlessly, the various methods used being as follows:

Morphine and scopolamine followed by ether, in	196 cases
Morphine and scopolamine followed by nitrous oxide	36 cases
*Ether analgesia and anesthesia, in	142 cases

*Note: These cases were delivered before the use of sodium amytal was begun.

Nitrous oxide, analgesia and anesthesia, in	28 cases
Sodium amytal followed either by inhalation analgesia and anesthesia; or by colonic ether and later by general anesthesia, in	85 cases
Colonic ether followed by inhalation ether, in	13 cases
Total	500 cases

The methods of delivery were as follows:

Modified Scanzoni method, 172 cases:	High medium forceps	34 cases
	Low medium forceps	89 cases
	Low forceps	49 cases
Total		172 cases
Internal podalic version and breech extraction		317 cases
Abdominal cesarean section		11 cases

Manual dilatation in cases of emergency in which the os was not completely dilated, was performed in 11 cases.

The Voorhees bag was used 11 times.

Episiotomy was performed in 50 cases.

Forceps were not applied to the after-coming head in any of these cases.

In the entire series there were 10 fetal deaths, of which 7 babies were stillborn and three died during the first two weeks. Of the three which died subsequent to delivery, autopsy showed congenital anomalies of the heart in two and enlarged thymus in the other. The deaths were attributed to these conditions. Of the stillborn babies two were macerated having been dead before the onset of labor. Thus there were five fetal deaths which could in no way be attributed to the labor or delivery. The five stillbirths in which the cause of death could be attributed to the labor or to the delivery were as follows:

Asphyxia due to separation of the placenta	2 cases
Asphyxia due to unusually prolonged first stage of labor	2 cases
Birth injury (?)	1 case

In the two cases of separation of the placenta the accident occurred late in labor and with a failing fetal heart in each case. Version was performed but too late to save the baby. In the two cases of prolonged first stage of labor the fetal heart became very irregular in each before there was complete dilatation of the os. In one of these, podalic version was performed. In the other there was a tonic contraction of the uterus and contraction ring. The delivery was by forceps. This was a case of an elderly primipara with a very rigid cervix. Cesarean section undoubtedly should have been performed early in labor. The fifth case was apparently an easy one. The patient was a primipara. Labor was of normal duration, and the fetal heart was normal at the time of delivery. Delivery by version was not at all difficult. The cord was pulsating at the termination of the birth, but ceased almost immediately and all efforts at resuscitation failed. Fetal heartbeats were never heard during efforts at resuscitation. At autopsy only two things were found. There was a slight tear of the tentorium but no

accumulation of blood. The heart was about one-half normal size and the foramen ovale was large enough to admit the little finger. Otherwise the heart was normal. The death was attributed to the tear in the tentorium, although the diagnosis was somewhat in doubt.

There were therefore, in the 500 cases, 5 fetal deaths, which could be attributed to the labor or the delivery or 1 per cent fetal mortality.

In the 172 cases delivered by the modified Seanzoni method there was one fetal death or 0.58 fetal mortality.

I would attribute the slightly lower fetal mortality of my series as compared with that of the residents, if to anything except their unusually difficult cases, to the fact that I have been less inclined to wait for spontaneous rotation and as a rule have interfered earlier in the second stage.

Altogether our results show that when these methods of delivery are used at the most suitable time for delivery, which is early in the second stage of labor, uniformly good results may be expected.

OSBORN BUILDING.

Hogben, L.: The Scientific Basis of Organotherapy. J. M. A. South Africa 3: 663, 1929.

Organotherapy is discussed from the standpoint of the experimental biologist. The importance of the appropriate methods of preparation, standardization, and administration of biologic products is stressed. It is pointed out that the medical profession is more apt to accept the interested testimony of the manufacturer, rather than to rely on laboratory investigations. The author believes that important contributions will ultimately be made by the study of the internal secretions, but at present if the clinician proceeds to make use of commercial preparations of doubtful activity, organotherapy will be brought into disrepute and research will be impeded rather than advanced. He states that endocrinology is at the moment the nucleus for some of the wildest, most undisciplined and discreditable speculations that can be extracted from contemporary science, and concludes that scientifically, "the glandular temperamentalists are in the same hierarchy as the palmists and astrologers."

FRANK SPIELMAN.

PROGNOSIS IN NEPHRITIS COMPLICATING PREGNANCY*

BY H. J. STANDER, M.D., AND C. H. PECKHAM, M.D., BALTIMORE, MD.

(From the Department of Obstetrics, Johns Hopkins University and Hospital)

IN 1926 we proposed a classification of the toxemias of pregnancy which included the groups designated as "low reserve kidney" and "chronic nephritis." We have made use of this classification since the above date and have found it generally satisfactory, provided the diagnosis in each case is made by following strictly the criteria suggested for its establishment. There are certain defects in the classification, particularly in connection with the differentiation between a severe "low reserve kidney" and a mild "chronic nephritis"; consequently, we will leave for a later paper the consideration of differential diagnosis between chronic nephritis and other types of toxemia of pregnancy.

During the past several years, we have been impressed with the number of women receiving care in our clinic who succumb to nephritis either while in the hospital or within a few years after discharge. For this reason we have attempted a complete as possible follow-up study on a fairly large series of patients suffering from nephritis, namely, 236 patients with 297 hospital admissions, who were admitted to our service during the ten-year period from January 1, 1919, to December 31, 1928. We have been able to obtain the full service of a social worker who visited the patients at their homes and brought them back to the clinic for reexaminations. In this manner, we have been able to trace over 57 per cent of the patients studied, and are in a position to draw final conclusions about 135 women in whom the diagnosis of nephritis complicating pregnancy had been made while in the hospital. The findings in these statistical and follow-up studies are presented in tables, supplemented by charts.

From Table I it will be seen that our patients were almost equally divided between whites and blacks. Of the total admissions, about half were delivered at full term, while premature termination of the pregnancy occurred in 17 per cent, and spontaneous or therapeutic abortion in 15 per cent. Of the 260 pregnancies observed on the service 63.46 per cent were allowed to go to term, 19.23 per cent terminated prematurely but after the child had reached a period of viability, while the remaining 17.31 per cent were abortions.

In Table II is given the age of the patients when the diagnosis of nephritis was made, as compared with that of the general clinic popu-

*Read before the East New York Medical Society, December 22, 1930.

TABLE I. DATA ON ADMISSIONS OF NEPHRITIC PATIENTS
JAN. 1, 1919 TO DEC. 31, 1928

Total patients			236
Admitted twice	28		28
Admitted three times	12		24
Admitted four times	3		9
Total admissions			297
Type of admission:			PER CENT
Full-term spontaneous	97	}	55.55
Full-term operative	68		
Premature spontaneous	18		16.84
Premature operative	32		
Abortion spontaneous	17		5.72
Abortion therapeutic	28		9.43
Not pregnant	7		2.36
Postpartum	4		1.35
Discharged before delivery	26		8.75
	297		100.00
Race:			
White	115	or	48.73
Black	121	or	51.27

lation. It will be noted that nephritis is relatively much more common between the ages of thirty and forty years, while its incidence is low in the women below thirty years of age. This is strikingly illustrated when we note that about 90 per cent of the total number of patients admitted to the clinic were under thirty years of age, whereas only 46 per cent of the nephritic patients fall in that age group. The increased age of the nephritic woman is further demonstrated by the fact that her mean age, when first seen with nephritis was over six years greater than that for the general clinic population.

Studying the incidence of nephritis from the point of view of parity, we observe that it increases with multiparity. Although over 50 per cent of all the patients in our clinic during the ten-year period under consideration were primigravidae, only 30 per cent of our nephritic patients belong in that group. In Table III, we have compared the incidence of the nephritic patients with the total material of the clinic, and this shows that as the third pregnancy is approached the incidence of nephritis becomes and remains higher than the incidence of our total clinic material for the various parity groups. This is graphically demonstrated in Fig. V.

As will be seen from Table IV, only 4 per cent of our nephritic patients had previous eclampsia. This is a very low figure when we consider that about one-fifth of all eclamptic patients develop permanent kidney damage, and is, of course, dependent upon the fact that chronic nephritis occurs much more frequently in pregnancy than does eclampsia. From this table it will also be noted that less than 10 per cent of the nephritic patients had a definite complicating heart dis-

ease; an interesting observation in view of the opinion of some that cardiac involvement is a usual accompaniment of chronic nephritis.

TABLE II. AGE OF PATIENTS WHEN FIRST SEEN WITH NEPHRITIS

AGE	CASES	PER CENT	PER CENT OF PATIENTS IN EACH AGE GROUP IN ENTIRE HOSPITAL POPULATION
- 19 years	27	11.44	43.8
20 - 24 years	43	18.22	32.1
25 - 29 years	39	16.53	13.3
30 - 34 years	41	17.37	5.9
35 - 39 years	57	24.15	3.7
40 - years	29	12.29	1.2
Total	236	100.00	100.00
Mean age of nephritic patients			30.14 years
Mean age of total hospital patients			23.86 years

TABLE III. PARITY OF PATIENTS WHEN FIRST SEEN WITH NEPHRITIS

PARA	CASES	PER CENT NEPHRITIC PATIENTS	PER CENT EACH PARA IN TOTAL HOSPITAL PATIENTS
0	71	30.08	52.79
1	29	12.29	17.86
2	22	9.32	8.90
3	20	8.47	5.54
4	12	5.08	3.73
5	16	6.78	2.85
6	15	6.36	2.34
7	12	5.08	1.61
8	9	3.81	1.29
9	7	2.97	0.92
10 & over	23	9.75	2.18
Total	236	99.99	100.01

TABLE IV. INCIDENCE OF COMPLICATING DISEASE

Following eclampsia	10	4.24% of patients
Cardiac disease	22	9.32% of patients
Pyelitis	5	2.12% of patients
Syphilis	25	10.59% of patients
Total	62	26.27% of patients

The incidence of pyelitis and of syphilis is not higher than in our nonnephritic clinic patients.

The treatment in the hospital of the 236 nephritic patients is summarized in Table V. This shows that in 96 of them, or 37 per cent, was the pregnancy interrupted, and in 63 per cent of the cases was the patient allowed to proceed to full term. Active interference, either early or late in pregnancy, was therefore practiced in about one-third of the patients. In only 30 cases (12.71 per cent) was future child-bearing rendered impossible by sterilization, either at the time of delivery or during or after the puerperium.

In Table VI, we see the results to the offspring where the mother is suffering from nephritis. In viable babies the mortality is 21.4 per

cent, as compared with 9.5 per cent in the total clinic population. This figure does not include pregnancies terminating in abortions. Furthermore, the table shows that the prognosis for the child becomes proportionately worse with increasing multiparity.

Out of 236 nephritic patients admitted to this service, we were able to trace 135, while no information could be obtained concerning the

TABLE V. PREMATURE TERMINATION OF PREGNANCY

Labor induced near term	43	} 26.15%	} Of total nephritic patients delivered
Labor induced premature	25		
Therapeutic abortions	28		

TABLE VI. FETAL MORTALITY ACCORDING TO PARITY OF MOTHER

		PER CENT	
	Para 0	8 deaths	11.27
	Para 1 and 2	13 deaths	25.49
	Para 3 and 4	10 deaths	31.25
	Para 5, 6 and 7	7 deaths	21.21
	Para 8, 9 and 10	8 deaths	30.77
FETAL MORTALITY	DEATHS	MORTALITY PER CENT	MORTALITY PER CENT FOR TOTAL HOSPITAL POPULATION
Premature	26	52.00	56.48
Full term	20	12.12	6.33
Total (viable fetus)	46	21.40	9.51

TABLE VII. MATERNAL MORTALITY

Total admissions	297
Total deliveries	236
Total traced	135, 57.20% of total patients
Total dead	46
Total alive	89
Total died in hospital	13
Total died later	33
Total died, nephritis	37
Total died, other causes	7
Total died, cause unknown	2
Total alive, no nephritis	26
Total alive, not examined	13
Total alive, moderate nephritis	20
Total alive, severe nephritis	30
Died Nephritis	37, 42.53%
Alive Nephritis	50

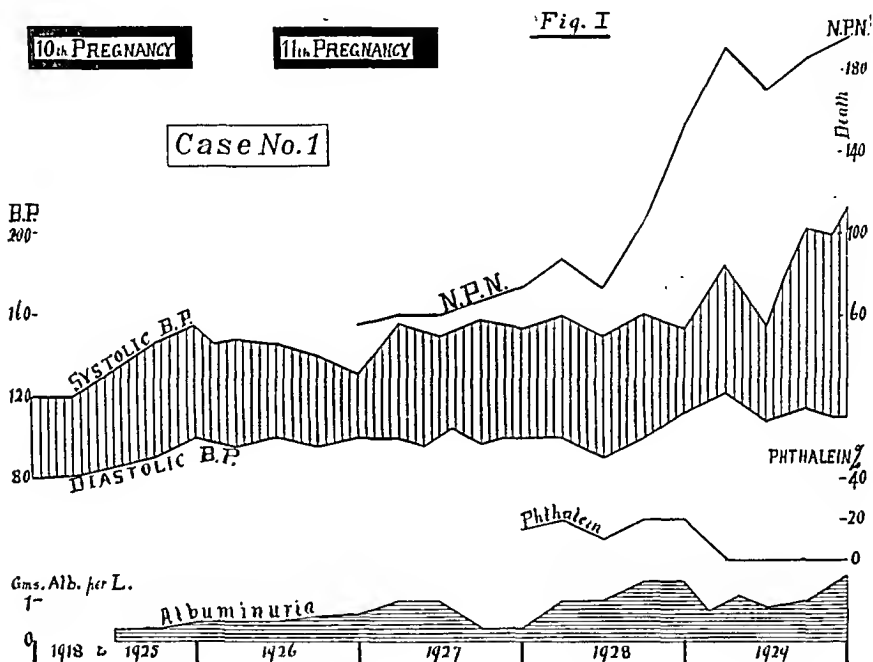
remainder. Of these 135 patients, 46 have died while 89 are still living. Of the 46 deaths, 37 were due to nephritis and 7 to other causes, while in 2 instances the cause of death could not be ascertained, as shown in Table VII. It may be stated here that the cause of death in each case was verified by autopsy or investigation of the death certificate as filed with the local Department of Health.

In Fig. VI, the mortality among the nephritic women is compared with the total death rate in this country for women between the ages of thirty and forty years, as given in the standard statistical life tables.

As most of the patients whom we have been able to trace fall in this age group, we feel that such a comparison is fairly logical.

Our mortality rates for both mother and child in this series are so appallingly high, that we must review the treatment these patients received at our hands. It may be said that we have been far too conservative, and this is amply shown in the charts of the four patients represented in Figs. I, II, III, and IV, all of whom died from nephritis as shown by autopsy.

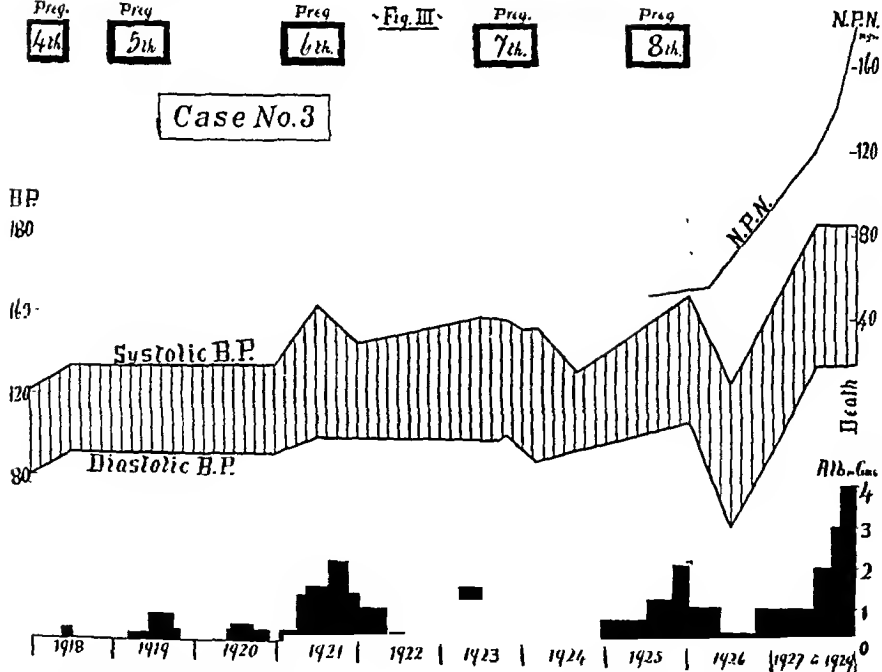
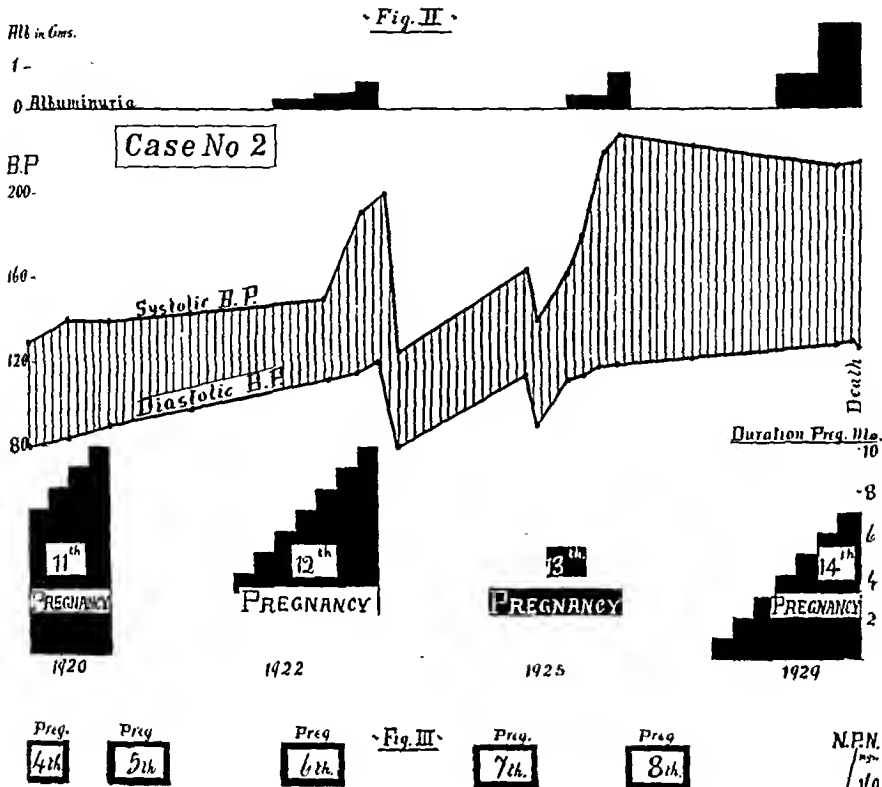
CASE 1.—The first patient, shows a hypertension and albuminuria starting about the middle of her tenth pregnancy. Afterward the blood pressure never returned to normal, nor did the albuminuria disappear. At that time, she presented convincing evidence of kidney damage, yet we allowed her to become pregnant for the



eleventh time, and to proceed to term without interruption. At the middle of the eleventh pregnancy she began to show nitrogenous retention, and from then onward, the downward course was progressive, and death occurred from kidney disease two years later. We feel that this patient should have been sterilized early in her tenth pregnancy.

CASE 2.—Patient (Fig. II), presents an even more inerminating story. In this instance, we had all the necessary evidence of kidney damage in the eleventh pregnancy, yet she was allowed to have three more pregnancies, and died of nephritis during the latter half of her fourteenth pregnancy. It is interesting to note that in this case after the twelfth pregnancy the blood pressure dropped to a normal systolic and an only slightly elevated diastolic, while the albuminuria disappeared. There is, perhaps, some excuse for not having sterilized her after this delivery, although the behavior of the blood pressure during and after the eleventh pregnancy would indicate the existence of a nephritis rather than preeclampsia. There is, however, no justification for allowing this patient to proceed from a thirteenth to a fourteenth pregnancy.

CASE 3.—Patient (Fig. III) had a diastolic blood pressure of 90 or above from the end of her fourth pregnancy, and a permanent albuminuria from her sixth pregnancy on; yet she went through two additional pregnancies, dying three years after her last confinement.



CASE 4.—(Fig. IV.) We saw a blood pressure of 180/120 at the end of the first pregnancy in this patient. From the behavior of the blood pressure and albuminuria following this pregnancy, it is probable that she suffered from pre-eclampsia at that time; but there was certainly no reason to doubt the existence

of a chronic nephritis following the fourth pregnancy; yet she was allowed to become pregnant three more times, with a blood pressure ranging around 160/110 and 200/140 following the fifth and sixth pregnancy, reaching 200/150 at the third month of her seventh and last pregnancy.

These four patients were selected at random from the women who have died on our service from chronic nephritis. We feel from the evidence presented in the charts that our treatment in these cases, as well as in many other nephritic patients, has been too conservative. It furthermore seems to us that the added strain of repeated pregnancy in women who present signs of kidney damage, must inevitably aggravate the disease and shorten the life of the patient. This is further evidenced by the increasing incidence of nephritis as multiparity proceeds, as shown in Fig. V.

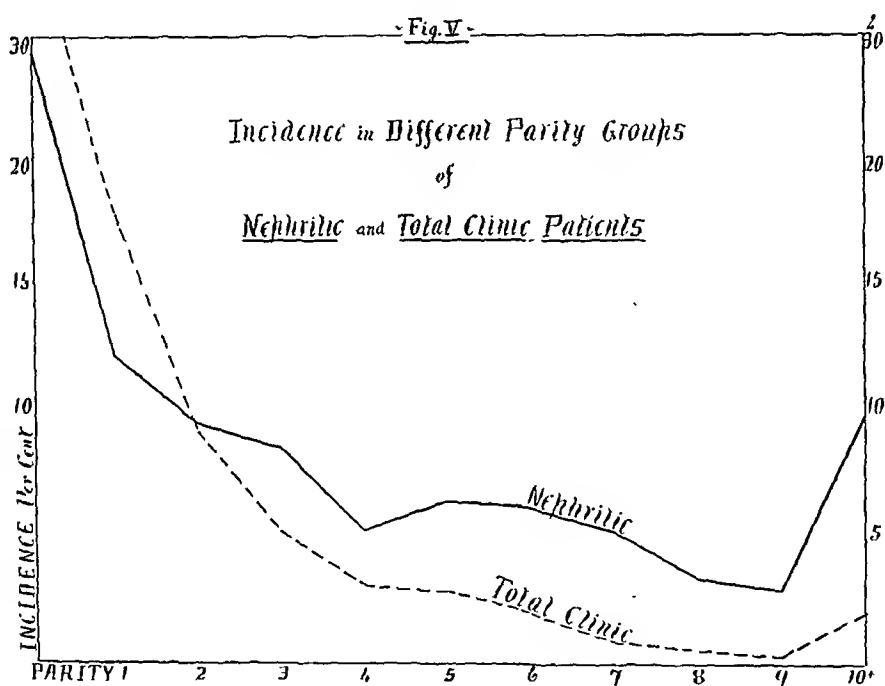


In the 135 women traced, we found that 26 or 19.27 per cent have no demonstrable sign or symptom suggesting the existence of chronic nephritis at present, thus indicating that the original diagnosis was incorrect. Of the remaining 109 patients, 46 are dead, 30 have severe nephritis, 20 are suffering from moderate but definite kidney damage, while in 13 cases we have been unable to obtain information beyond the fact that they are alive.

It seems, therefore, that over 80 per cent of our diagnoses of chronic nephritis were correct, whereas in one case out of five, we have diagnosed a chronic nephritis when we were dealing actually with a low reserve kidney or in rare instances with preeclampsia. We are of the opinion that with closer study this percentage of mistaken diagnosis may be decreased, but on the other hand we feel that this type of error

in diagnosis is not as grave as failure to recognize the existence of a chronic nephritis. If we must err in diagnosis in a small fraction of our patients, it would seem preferable to designate an occasional case of low reserve kidney as nephritis, rather than the reverse.

We do not wish to discuss the many factors that may be of help in the diagnosis of chronic nephritis, which will be considered in a later paper, but we cannot refrain from commenting upon a few points. The presence of albuminuria is not essential to the diagnosis, nor is it necessary that the patient have such symptoms as headache, visual disturbances, or malaise. In most of the fatal cases of nephritis in this series the patients had no, or very slight, symptoms or complaints



until shortly before the nitrogenous retention became marked and the terminal stage was reached. Too much emphasis should not be placed on symptoms, or rather, the absence of symptoms.

Persistent hypertension without albuminuria and symptoms is sometimes misleading, and the so-called "essential hypertension" has often lured the physician into a false sense of security. We view with great concern any patient showing hypertension persisting for several months following pregnancy provided other causative factors are eliminated, even though albuminuria, edema and symptoms are absent. We feel that signs of serious renal involvement will ultimately appear in such cases, although for some time these patients may reveal no sign or symptom beyond the hypertension.

Pregnancy is undoubtedly one of the best kidney function tests, as it exerts a slowly but steadily increasing strain on these organs. At

present, we possess no adequate method of measuring this added work, but it must be of considerable magnitude as is evidenced by the large percentage of women who have apparently normal kidneys while not pregnant but show signs of decreased kidney function as a pregnancy appears and proceeds to term.

We are not able to state that our patients with chronic nephritis would not die from the disease were they not allowed to become pregnant, but we are strongly of the opinion that the added strain of pregnancy, and especially of repeated pregnancies, must inevitably hasten the end.

In view of the large maternal mortality and the very poor prognosis for the offspring in the series of patients studied, we advocate interference with birth control or actual sterilization rather than conservative and expectant treatment in a large percentage of pregnant women with definite chronic nephritis. No universal rule can be laid down, but we feel that where there is no doubt that a chronic nephritis exists, it is our duty to prevent the strain of pregnancy and we are justified in following conservative treatment only when the patient is anxious to assume the responsibility on personal or other grounds.

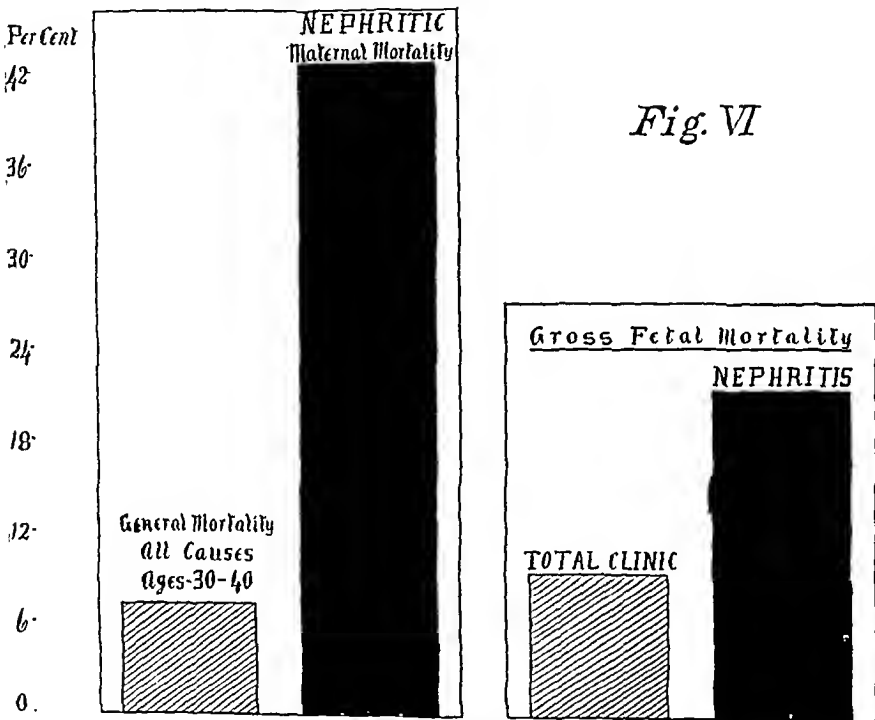
We have been very strongly impressed and surprised with the outstanding finding of this study of the end-results in chronic nephritis initiated or aggravated by pregnancy; and that is, a death rate, immediate and within a relatively short period of time, of 42.5 per cent among the mothers. A study of the 37 deaths from chronic nephritis showed the following results:

TABLE VIII

YEAR SEEN WITH NEPHRITIS	DIED IN CLINIC	DIED OUTSIDE	
		NUMBER	YEARS LATER
1919	0	1	5
1920	0	2	2, 4
1921	1	3	4, 5, 6
1922	2	3	3, 4, 5
1923	0	3	2, 6, 6
1924	1	2	4, 6
1925	3	4	1, 3, 3, 4
1926	0	1	4
1927	0	3	2, 2, 2
1928	3	5	1, 1, 2, 2, 2
Total	10	27	3.37 average years

We have not attempted to study the actual duration of chronic nephritis in each fatal case, as such an undertaking is an almost impossible task due to the difficulty of establishing the date of the first appearance of the disease. However, as the duration of life in the patients dying outside the hospital, after a diagnosis of nephritis had been made in the hospital, averaged only 3.37 years, and in addition 27 per cent of the patients who died had died while in this hospital,

the prognosis in patients showing signs of kidney damage during a pregnancy is indeed very grave and far more so than we had formerly believed. The effect of pregnancy on chronic nephritis is further illustrated by the fact that further pregnancies were allowed in many of the cases which later terminated fatally, whereas in only 4 of the 50 nephritic women now alive had a pregnancy subsequent to the one in which the diagnosis of nephritis was made. It seems significant that the duration of life to date in the living women is now 6.12 years, a figure almost twice that of the duration of life in the fatal cases, so many of whom had become pregnant after chronic nephritis had been diagnosed by us.



CONCLUSIONS

1. Chronic nephritis usually manifests itself during the later years of the child-bearing period, as is evidenced by the fact that over half of the patients in our series are over thirty years of age, while only one-tenth of the total clinic patients are in this age group.

2. There appears to be a definite correlation between the incidence of nephritis and increasing parity. Although 80 per cent of the total clinic patients are either primiparae or have had one previous pregnancy, only 42 per cent of the nephritic women fall into this category.

3. We have observed a surprisingly small incidence of concomitant cardiac disease (9.3 per cent) and pyelitis (2.1 per cent) in our series of nephritic women.

4. The absence of albuminuria, edema, symptoms, and signs of decreased kidney function in the presence of a hypertension, does not speak against the existence of an underlying or developing chronic nephritis. The term "essential hypertension" as denoting no kidney damage is a dangerous one to employ as the hypertension may be the first sign to precede the development of serious renal impairment dependent upon arteriosclerotic changes in the kidneys.

5. The fetal mortality in our series of nephritic women is over 21 per cent in viable babies, as compared with 9.5 per cent for all patients in our clinic.

6. The maternal mortality occurring within ten years in our series is appallingly high, being 42.53 per cent. The average mortality for women between the ages of thirty and forty years in this country is 7.5 per cent.

7. The added strain of pregnancy on renal function undoubtedly aggravates an underlying or existing chronic kidney disease, and must often materially shorten the patient's life.

8. The prognosis in chronic nephritis complicating pregnancy is very grave, the average duration of life after definite diagnosis had been made, being only three and thirty-seven hundredths years in the fatal cases. On the other hand, only 4 of the 50 nephritic women now alive have had subsequent pregnancies and to date their average duration of life is six and twelve hundredths years, following the diagnosis of chronic nephritis.

9. We advocate more radical treatment than has been exercised in the care of the patients in our series. In the presence of a definite chronic nephritis it is usually advisable to terminate pregnancy and prevent further pregnancies by either birth control or sterilization, depending upon the individual case.

10. The time to prevent kidney strain from pregnancy is not after a chronic nephritis has become severe, but while it is still mild in character, or in its incipency, for then only can we hope to be of assistance to our nephritic patients.

THE BLOOD SUGAR IN ECLAMPSIA

By JOHN M. LAFERTY, M.D., PHILADELPHIA, PA.

(From the Dept. of Obstetrics, St. Mary's Hospital)

THE exact etiology of the symptom complex called eclampsia is still unsolved. The work of many earnest investigators of this problem would indicate that it is a disease due to a disorganization of the maternal metabolism which is instigated by pregnancy.

Titus¹ and his coworkers have advanced the theory that a glucose deficiency of the body is the causative factor, and in favor of this viewpoint we have the following facts additional to or amplifying those he has presented: (1) a depletion of the reserve carbohydrate, glycogen, is found postmortem in all cases of eclampsia; (2) the fetus is known to derive its nourishment largely from the carbohydrate in the mother's blood; (3) the pituitary, adrenals, thyroid, and pancreas, all of which have a proved influence on the carbohydrate metabolism, are characteristically altered during pregnancy; (4) the intravenous administration of glucose is of great value in the treatment of various toxemias including eclampsia, a fact first noted by Titus¹ and later confirmed by many clinics.

If the carbohydrate metabolism is profoundly disturbed it is reasonable to assume that the blood sugar should reflect this disturbance in some manner and Titus² has shown that if the blood is examined at five-minute intervals there is, (1) a marked and significant fluctuation in the blood-sugar level; (2) a drop in the blood sugar from a higher to a lower level preceding a convulsion; (3) a rise in the blood-sugar level is noted following a convulsion; (4) subnormal blood-sugar levels are frequently noted.

A few investigators, notably Stauder and Harrison³ of the Johns Hopkins Hospital have attempted to discredit the work of Titus without making an effort to repeat it. They contend that because a high blood sugar is not infrequently found during the course of an eclamptic attack that a hyperglycemia is characteristic of this disease, without regard to the well-known fact that any muscular exertion even less severe than an eclamptic convulsion is followed physiologically by hyperglycemia. They have recommended the use of insulin because of this hyperglycemia which is obviously physiologic and temporary, a therapy which is certainly questionable if a glucose deficiency of the body exists.

Titus claims that a glucose deficiency of the body is the cause of eclampsia and the blood-sugar findings in this disease show a profound disturbance of the carbohydrate metabolism. The blood-sugar

level normally ranges between 80 and 120 mg. per 100 c.c. and some mechanism operates to maintain this level probably by increasing the production of insulin if it goes too high and by releasing glucose into the blood from the reserve stored in the liver if it drops too low; in starvation the blood-sugar level is lower but this lower level is maintained by the body converting some of its proteid into glucose; if the blood sugar falls below a certain point convulsions and death ensue.

Cori and Cori⁴ have recently shown that during severe muscular exertion and in a deficiency of oxygen, adrenalin causes the glycogen stored in the muscles to be incompletely oxidized into lactic acid and that this lactic acid was reconverted into glucose by the liver. In pregnancy any of the following conditions or their combinations may operate to produce a disturbance of the carbohydrate balance: (1) a continuous and increasingly heavy withdrawal of glucose from the maternal blood to nourish the products of conception; (2) an excessive consumption of glucose by the maternal organism; (3) excessive withdrawal of glucose from the maternal blood due to overproduction of insulin; (4) an inadequate supply of glucose due to faulty alimentation.

With these facts relative to the carbohydrate metabolism in mind, we can now picture theoretically the sequence of events in minor toxemias and eclampsia: we have a disturbance of the carbohydrate balance due to one or more of the conditions mentioned, the excess of glucose withdrawn being replenished from the reserve stored in the liver until that is exhausted, then an attempt is made to supply the increasing deficiency by manufacturing glucose from the body protein; this supply proving inadequate and the deficiency becoming acute, as a last effort, we have the eclamptic fit which by releasing, as lactic acid, the glycogen stored in the muscles, supplies material which the liver can quickly convert into glucose.

The blood-sugar level at any one reading merely shows the status at the time the blood was withdrawn and to obtain a true picture of the process it is necessary that frequent examinations be made. The changes occur rapidly and hence the specimens should be withdrawn at short intervals of time. Until the process is stabilized or until the available glucose reserve is depleted there should be more normal and above normal readings than subnormal. Subnormal values will be obtained in all cases at some time if a sufficient number of examinations are made.

The following study of the blood sugar in eclampsia repeats the work of Titus and corroborates his findings regarding the fluctuation in blood sugar during eclampsia with relative hypoglycemic levels before the convulsions. The cases, 10 in number, are from the serv-

ices of Drs. J. Stuart Lawrance at St. Mary's Hospital, and George Hanna at Frankford Hospital. All data have been depleted from the case histories except that relevant to the present study, for the sake of brevity. The blood-sugar examinations were made in the laboratory of St. Mary's Hospital, in charge of Dr. William Reese, and were made by the method of Folin and Wu, which gives a normal range between 80 and 120 mg. per 100 c.c. The examinations were usually made immediately after the blood was taken and in no instance later than four hours after the blood was withdrawn, calcium oxalate being used as an anticoagulant.

In 6 of the 10 cases the examinations were made at five-minute intervals, in one case at ten-minute intervals, in one case at half-hour intervals and in two cases at irregular intervals.

CASE 1.—St. Mary's Hospital, 1930. Antepartum Eclampsia. Recovered.

8:30 A.M. First convulsion.
9:00 A.M. Second convulsion.
9:40 A.M. Third convulsion.
9:55 A.M. Fourth convulsion.
10:55 A.M. Fifth convulsion.
11:40 A.M. Sixth convulsion.
11:41 A.M. First blood sugar 160 mg. per 100 c.c.
11:45 A.M. Second blood sugar 145 mg. per 100 c.c.
11:50 A.M. Third blood sugar 130 mg. per 100 c.c.
11:55 A.M. Fourth blood sugar 100 mg. per 100 c.c.

Patient had a total of 13 convulsions.

COMMENT

1. Blood examined one minute after sixth convulsion and three hours and eleven minutes after onset.
2. Fluctuations 15 to 30 mg.
3. Note high blood sugar one minute after convulsion, also drop of 60 mg. in fifteen minutes.
4. Few examinations and no readings below normal.

CASE 2.—St. Mary's Hospital 1930. Antepartum Eclampsia. Died.

1:30 A.M. First convulsion.
3:40 P.M. Second convulsion.
4:10 P.M. Third convulsion.
4:30 P.M. First blood sugar 73 mg. per 100 c.c.
4:50 P.M. Second blood sugar 93 mg. per 100 c.c.
4:55 P.M. Third blood sugar 80 mg. per 100 c.c.
5:00 P.M. Fourth blood sugar 88 mg. per 100 c.c.
5:05 P.M. Fifth blood sugar 90 mg. per 100 c.c.
5:07 P.M. Fourth convulsion.
5:10 P.M. Sixth blood sugar 81 mg. per 100 c.c.
5:15 P.M. Seventh blood sugar 87 mg. per 100 c.c.
5:17 P.M. Fifth convulsion.

Patient had a total of 19 convulsions before death thirty hours later.

COMMENT

1. Blood was examined twenty minutes after third convulsion and fifteen hours after onset examinations were made at five-minute intervals.

2. Note low normal and one subnormal reading during period of active convulsions.

3. The convulsion at 5:07 P.M. did not show any drop two minutes before, but the values being low a significant drop may have occurred in these two minutes. That such a drop did occur is suggested by the low reading three minutes later. This low blood sugar so soon after a convulsion shows either a badly damaged liver or a very low reserve.

CASE 3.—St. Mary's Hospital 1930. Antepartum Eclampsia. Recovered.

8:45 A.M. First convulsion.

11:45 A.M. Second convulsion.

11:55 A.M. First blood sugar 73 mg. per 100 c.c.

12:00 N. Second blood sugar 104 mg. per 100 c.c.

12:05 P.M. Third blood sugar 91 mg. per 100 c.c.

12:15 P.M. Fourth blood sugar 98 mg. per 100 c.c.

12:20 P.M. Fifth blood sugar 93 mg. per 100 c.c.

Patient had a total of 4 convulsions.

COMMENT

1. Blood examinations were made after second convulsion and three hours and ten minutes after onset of disease, examinations were made at five-minute intervals.

2. Fluctuations 5 to 31 mg.

3. One subnormal reading, the others within normal range.

CASE 4.—Frankford Hospital 1928. Antepartum Eclampsia. Died.

6:30 A.M. Admitted to hospital in coma with history of having 7 convulsions since 1:30 A.M.

8:30 A.M. First blood sugar 125 mg. per 100 c.c.

8:31 A.M. 25 gm. glucose given intravenously.

9:45 A.M. 50 gm. glucose given intravenously.

9:50 A.M. Eighth convulsion.

10:20 A.M. Second blood sugar 74 mg. per 100 c.c.

10:25 A.M. Third blood sugar 92 mg. per 100 c.c.

10:30 A.M. Fourth blood sugar 89 mg. per 100 c.c.

10:33 A.M. Ninth convulsion.

10:35 A.M. Fifth blood sugar 145 mg. per 100 c.c.

10:40 A.M. Sixth blood sugar 129 mg. per 100 c.c.

10:50 A.M. Seventh blood sugar 128 mg. per 100 c.c.

10:55 A.M. Eighth blood sugar 122 mg. per 100 c.c.

11:00 A.M. Ninth blood sugar 93 mg. per 100 c.c.

11:05 A.M. Tenth blood sugar 70 mg. per 100 c.c.

11:30 A.M. Tenth convulsion.

Patient had a total of 18 convulsions before death.

COMMENT

1. Blood was examined after eighth convulsion and after 75 gm. of glucose had been given intravenously. Eight hours and fifty minutes after onset.

2. The sugar was apparently being withdrawn from the blood very rapidly because although patient was given 75 gm. glucose intravenously and had one convulsion within less than two hours the blood sugar was only 74 mg.

3. The blood sugar showed a slight drop at 10:30 which probably became great enough to precipitate the convulsion three minutes later. Note the rise in blood sugar two minutes after the convulsion.

4. The steady dropping of the blood sugar is clearly shown between 10:35 and 11:05, 75 mg. in a half hour and culminating in the convulsion at 11:10.

CASE 5.—Frankford Hospital 1929. Postpartum Eclampsia. Recovered.

6:30 A.M. Admitted to hospital with history of having two convulsions at home.
 10:05 A.M. First blood sugar 51 mg. per 100 c.c.
 10:10 A.M. Second blood sugar 41 mg. per 100 c.c. (Patient observed to twitch.)
 10:15 A.M. Third blood sugar 73 mg. per 100 c.c.
 10:20 A.M. Fourth blood sugar 46 mg. per 100 c.c.
 10:25 A.M. Fifth blood sugar 49 mg. per 100 c.c.
 10:10 A.M. Sixth blood sugar 75 mg. per 100 c.c.

Patient had only two convulsions, both before admission to hospital.

COMMENT

1. Blood examined at five-minute intervals. Fluctuations 2 to 32 mg.
2. Note extremely low values.

CASE 6.—Frankford Hospital 1930. Postpartum Eclampsia. Recovered.

7:05 A.M. First convulsion (8 hr. postpartum).
 8:30 A.M. Second convulsion.
 9:20 A.M. Third convulsion.
 9:55 A.M. First blood sugar 71 mg. per 100 c.c.
 10:00 A.M. Second blood sugar 72 mg. per 100 c.c.
 10:05 A.M. Third blood sugar 67 mg. per 100 c.c.
 10:10 A.M. Fourth blood sugar 73 mg. per 100 c.c.
 10:15 A.M. Fifth blood sugar 67 mg. per 100 c.c.
 10:22 A.M. Sixth blood sugar 55 mg. per 100 c.c. (Patient observed to twitch.)
 10:29 A.M. Seventh blood sugar 69 mg. per 100 c.c.
 10:45 A.M. Fourth convulsion.

Patient had six convulsions on first day, four days later she had 2 convulsions, the following day she had 5 convulsions, and two days later she had 3 convulsions, a total of 16 convulsions over a period of seven days. Patient was a deaf mute.

COMMENT

1. Blood was examined two hours and fifty minutes after onset and after third convulsion and at five- to seven-minute intervals.
2. Fluctuations 1 to 14 mg.
3. All readings below normal.

CASE 7.—St. Mary's Hospital 1928. Postpartum Eclampsia. Recovered.

June 17, 11:00 P.M. Patient admitted to hospital with a history of having five convulsions at home, the first at 5:00 A.M., eight hours postpartum and the others at 5:10 and 9:00 A.M., and at 1:30 and 9:00 P.M.
 11:15 P.M. First blood sugar 70 mg. per 100 c.c.
 June 18, 12:24 A.M. Second blood sugar 135 mg. per 100 c.c.
 12:34 A.M. Third blood sugar 130 mg. per 100 c.c.
 12:44 A.M. Fourth blood sugar 125 mg. per 100 c.c.
 12:54 A.M. Fifth blood sugar 120 mg. per 100 c.c.
 1:09 A.M. Sixth blood sugar 118 mg. per 100 c.c.

- 1:19 A.M. Seventh blood sugar 110 mg. per 100 c.c.
- 1:24 A.M. Eighth blood sugar 97 mg. per 100 c.c.
- 2:00 A.M. Ninth blood sugar 138 mg. per 100 c.c.
- 2:08 A.M. Tenth blood sugar 142 mg. per 100 c.c.
- 2:15 A.M. 100 gm. glucose given intravenously.
- 2:25 A.M. Eleventh blood sugar 150 mg. per 100 c.c.

Patient had a total of five convulsions before admission, none after.

COMMENT

1. Blood-sugar estimations made mostly at ten-minute intervals. The first was made eighteen and one-quarter hours after onset and after fifth convulsion.
2. Fluctuations in blood sugar values 5 to 65 mg.
3. One reading below normal.
4. Note steady drop from 12:24 to 1:24, then raise in next thirty-six minutes.
5. Note how quickly the glucose is withdrawn from the blood, the blood sugar at 2:25 was only 150 mg., ten minutes after 100 gm. glucose had been given intravenously, seven minutes before giving glucose it was 142 mg.

CASE 8.—St. Mary's Hospital 1930. Postpartum Eclampsia. Recovered.

April 15, 11:00 A.M. Admitted to hospital, had fourth convulsion just after admission and with a history of having 3 convulsions at home. The first at 1:30 P.M. and the second at midnight April 14. The third convulsion occurred at 8:00 A.M. April 15.

- 3:00 P.M. Fifth convulsion.
- 3:30 P.M. 25 gm. glucose given intravenously.
- 3:45 P.M. 25 gm. glucose given intravenously.
- 4:15 P.M. First blood sugar 42 mg. per 100 c.c.
- 4:15 P.M. Sixth convulsion (just as blood was being taken).
- 4:45 P.M. Second blood sugar 38 mg. per 100 c.c.
- 4:57 P.M. Third blood sugar 42 mg. per 100 c.c.
- 5:14 P.M. Fourth blood sugar 36 mg. per 100 c.c.
- 5:15 P.M. Seventh convulsion.
- 5:16 P.M. Fifth blood sugar 42 mg. per 100 c.c.
- 5:22 P.M. Sixth blood sugar 39 mg. per 100 c.c.

COMMENT

1. Blood examined at irregular intervals and fluctuation was slight 4 to 7 mg.
2. All examinations showed extremely low blood-sugar values.
3. Very little rise after the convulsion was noted, also very little drop before.
4. Patient was given glucose before examinations were made.

CASE 9.—Frankford Hospital 1929. Antepartum Eclampsia. Died.

- 1:30 A.M. Admitted to hospital in coma. Had convulsion just after admission.
- 1:35 A.M. 25 gm. glucose given intravenously.
- 2:10 A.M. Convulsion.
- 2:20 A.M. Blood sugar 180 mg. per 100 c.c.
- 2:35 A.M. Convulsion.
- 3:00 A.M. Convulsion.
- 3:40 A.M. Blood sugar 285 mg. per 100 c.c.
- 3:50 A.M. Convulsion.
- 4:00 A.M. Convulsion.

4:10 A.M. Blood sugar 110 mg. per 100 c.c.
 4:20 A.M. Convulsion.
 4:40 A.M. Blood sugar 100 mg. per 100 c.c.
 4:45 A.M. Convulsion, 5:25 A.M. convulsion, and 5:45 A.M. convulsion.
 7:00 A.M. 25 gm. glucose given.
 7:30 A.M. Convulsion, 8:00 A.M. convulsion, and 11:00 A.M. convulsion.
 12:15 P.M. Blood sugar 77 mg. per 100 c.c.
 12:30 P.M. Convulsion, 1:00, 2:00, and 3:15 P.M. convulsion.
 4:00 P.M. 25 gm. glucose given intravenously.
 4:15 P.M. Convulsion.
 5:25 P.M. Blood sugar 107 mg. per 100 c.c.
 5:30 P.M. Convulsion.
 5:31 P.M. Blood sugar 115 mg. per 100 c.c.
 5:45 P.M. Blood sugar 97 mg. per 100 c.c.
 5:46 P.M. Convulsion.
 6:40 P.M. Blood sugar 97 mg. per 100 c.c.
 7:00 P.M. Convulsion.

Patient had a total of 27 convulsions before death.

COMMENT

1. Blood examined at irregular intervals.
2. One reading slightly below normal 77 mg. at 12:15 P.M.
3. Note the gradual dropping in level from 180 and 285 mg. to 97 mg. as the disease progressed.

CASE 10.—Frankford Hospital. Postpartum Eclampsia. Recovered.

March 10, 1930, 10:30 P.M. Admitted to hospital with history of having 4 convulsions since noon.
 11:00 P.M. Blood sugar 220 mg. per 100 c.c.
 12:00 P.M. Fifth convulsion.
 March 11, 1930, 12:30 P.M. Sixth convulsion.
 1:00 P.M. Seventh convulsion.
 3:00 P.M. Eighth convulsion.
 4:00 P.M. Ninth convulsion.
 6:00 P.M. Tenth convulsion.
 7:20 P.M. Eleventh convulsion.
 8:40 P.M. Twelfth convulsion.
 10:00 P.M. Thirteenth convulsion.
 11:15 P.M. Blood sugar 140 mg. per 100 c.c.
 11:45 P.M. Blood sugar 140 mg. per 100 c.c.
 12:15 P.M. Blood sugar 90 mg. per 100 c.c.
 12:45 P.M. Blood sugar 110 mg. per 100 c.c.
 1:15 P.M. Blood sugar 160 mg. per 100 c.c.
 1:45 P.M. Blood sugar 162 mg. per 100 c.c.

Patient had a total of 13 convulsions.

COMMENT

1. Blood was examined at thirty-minute intervals and showed fluctuations of from 0 to 50 mg.
2. All examinations showed normal or above normal values.
3. Patient was recovering when examinations were made.

SUMMARY OF CASE REPORTS

1. All cases showed significant fluctuations in blood-sugar levels except Case 8; in this case the blood was examined at irregular intervals and all values were very low.

2. Eight of the ten cases showed one or more readings below normal. In the two cases where no subnormal readings were noted one had only four examinations and the other was recovering from the disease.

3. A definite tendency for the blood-sugar level to drop before a convulsion was noted in all cases when the examinations were made while the convulsions were occurring.

4. A rise in blood sugar was noted to follow the convulsion in Cases 1, 4, and 9.

5. That the blood sugar is removed from the circulation very rapidly is shown in Cases 1, 4, 7, 9.

6. A failure of the blood-sugar level to rise after a convulsion, and also a definite tendency to a lower blood-sugar level was noted in those cases where the process had lasted some time.

CONCLUSIONS

1. The glucose deficiency theory of Titus' offers a rational explanation for most of the phenomena observed in eclampsia, and it will probably prove to be, when more data in reference to the biochemistry of the body are available, at least in part the explanation of this perplexing disease.

2. The convulsion in eclampsia is part of the body mechanism for combating a glucose deficiency and hence should be considered a protective reaction just as fever, vomiting and dyspnea are protective reactions.

3. The present study corroborates the work of Titus on the blood-sugar findings in eclampsia.

4. Stander's³ article in disagreement with this does not constitute a valid criticism of the work done by Titus as no attempt was made to duplicate his researches.

REFERENCES

- (1) Titus, Paul, Hoffman, G. L., and Givens, M. H.: J. A. M. A. 74: 777, 1920; Titus, Paul, and Givens, M. H.: J. A. M. A. 78: 92, 1922. (2) Titus, Paul, Dodds, Paul, and Willetts, E. W.: AM. J. OBST. & GYNEC. 14: 89, 1927; Titus, Paul, Dodds, Paul, and Willetts, E. W.: AM. J. OBST. & GYNEC. 15: 303, 1928; Titus, Paul, and Willetts, E. W.: AM. J. OBST. & GYNEC. 18: 27, 1929; Lightbody, H. D.: AM. J. OBST. & GYNEC. 18: 36, 1929; Titus, Paul, Willetts, E. W., and Lightbody, H. D.: AM. J. OBST. & GYNEC. 19: 16, 1930. (3) Stander, H. J., and Harrison, E. P. N.: AM. J. OBST. & GYNEC. 18: 17, 1929. (4) Cori, C. C., and Cori, G. T.: J. Biol. Chem. 84: 683, 1929.

IS SALPINGITIS A FACTOR IN THE INCIDENCE OF TUBAL PREGNANCY?*

BY ROYAL C. VAN ETEN, M.D., F.A.C.S., NEW YORK, N. Y.

MANY theories have been advanced to explain ectopic formation, including salpingitis, retroversion, fibroids, kinking of the tubes by bands, the presence of accessory tubes or diverticula.

"It is generally believed that inflammation of the fallopian tubes by narrowing the lumen and in this way preventing the passage of the impregnated ovum to the uterus, is an important etiologic factor in ectopic gestation." Thus wrote H. C. Taylor, in a review of cases at the Roosevelt Hospital, New York, from 1909 to 1914. Of the 44 cases so reported, 76 per cent gave a history of inflammation of the appendages, or it was discovered at operation. Other writers give the following figures: Franz, 80 per cent; Prochonsk, 50 per cent; Schurman, 50 per cent; Falk, 33 per cent (50 cases).

These figures may seem to us very high and yet they can be still further raised if the cases are considered in which peritoneal adhesions were found. In almost every case, some bands and adhesions can be found. Tubes diseased by neisserian infection head the list, but tuberculous tubes are not infrequent.

With these figures in mind, I looked up the cases of tubal pregnancy occurring at the Sloane Hospital for Women for the last five years. This list includes all patients with ectopic pregnancies admitted to the hospital. A full pathologic report accompanied each one, so it was comparatively easy to get our conclusions from the charts themselves, and by personal talks with the members of the Staff.

Since 1926 and including 1930 to date, we have had 77 cases of tubal pregnancy in the hospital. Our findings differ from most of those above, in that only 8 cases, or 10.4 per cent showed signs of previous or concurrent tubal inflammation. When peritoneal adhesions were considered, a total of 20, or 27.7 per cent, was found. If both are taken together, a total of 28, or 36.3 per cent, was found. We had one case of tuberculous tubes and one remarkable case where a firm band of adhesions from the uterus itself to the peritoneum had caused a kinking of the tubes and probably an ectopic pregnancy.

Ahlfeld gives an interesting side light on this situation by stating that in an experience of many years at the University of Marburg, he saw so few cases of tubal gestation that he considers the relative freedom of his patients from gonorrhea, as compared with those in the large cities, to be the only explanation.

*Read before the Section of Obstetrics and Gynecology, New York Academy of Medicine, December 23, 1930.

We have tabulated all the details of our 77 cases. The pathologist states that a section through the affected tube near the site of an ectopic gestation, and especially where one has ruptured, gives a picture very similar to inflammation, with outpouring of round cells and leucocytes from the mother's blood. Recent adhesions and inflammatory reaction in addition to the hemorrhage are also seen. These pictures have doubtless deceived many in their reports as to the presence of inflammation in the tubes. Moreover, we all know how clear the other tube and its fimbriated extremity appears in a majority of instances at the time of operation, after we have cleared the clots away from it. Fourteen of our cases were unruptured at the time of operation, 63 ruptured.

It is of interest to note here that 2 of our 77 patients had repeated ectopic pregnancies, although none had concurrent ectopic and intra-uterine gestation, as reported by Stein.—One case: Vineberg, Brooks Wells, Keyes, Frankenthal, Young, Zinke, Haret; in instances, from 2 to 5, and Rongy, 12 in 100 cases.

It is also of interest to note that 16 of our patients received one transfusion and 3 two transfusions. Naturally, 10 of these were done in the last two years, as transfusions became more usual.

SUMMARY

1. The evidence in favor of previously existing inflammation was rather limited in our series of 77 cases, covering five years at the Sloane Hospital. Eight cases, or 10.4 per cent of 77, showed such evidence.

2. The pathologic picture is often misleading. Sections of the tubes remote from the lesions should always be taken.

3. The majority of our ectopic cases had had no previous inflammation or coexisting inflammation in the tubes.

4. This is contrary to the usually accepted beliefs.

A CASE OF RUDIMENTARY CONGENITAL HEART IN NEWBORN*

BY J. IRVING KUSHNER, M.D., NEW YORK, N. Y.

(From the Obstetric Service and the Pathological Laboratory of the Bronx Hospital)

THE mother of this child was twenty-nine years of age. She was one of a family of seven, all of whom were living except one who died at two weeks of age of smallpox and one who died during the influenza epidemic of 1918. The patient weighed 132 pounds, and was strong, healthy, and well nourished. Her past history was entirely negative. Her previous pregnancy had resulted in a normal living male child, three years of age.

The father was thirty years of age and belonged to a family of four boys. He weighed 156 pounds and had always been well and strong. The Wassermann reaction was negative in both parents.



Fig. 1.

The pregnancy was normal in every way. The mother went into labor about 4 A.M., with pains every thirty minutes. These pains continued irregular until 8 or 9 A.M. when they began to grow stronger and more frequent until she delivered herself at 2 P.M. of a female child, weighing $7\frac{3}{4}$ pounds. There was a little difficulty in the resuscitation of the baby because of three coils of cord around its neck; but the infant was put to bed breathing normally and crying lustily.

It was early noticed that the baby's face was slightly cyanotic but no attention was paid to that because it was attributed to the coils of cord that had been around the infant's neck at birth. The next morning, however, the cyanosis had spread

*Presented at a meeting of the Bronx Gynecological and Obstetrical Society, November 24, 1930.

all over its body and that on the face had become deeper in color. Examination showed a to and fro sawing murmur at the tricuspid area. The heart was not enlarged to percussion. There were no thrills palpable. The lungs, abdomen and head were all negative. A diagnosis of patent foramen ovale "blue baby" was made.

The baby did well for three days; then it began to have periods of increasing apnea. At the end of the third day it died in one of these attacks despite all efforts at stimulation. The diagnosis at death was asphyxia due to a patent foramen ovale.

The autopsy was done by Dr. S. A. Goldberg.

There were a few macular spots over the body, more on the abdomen, and the infant was slightly bluish. The ears, nose, and mouth appeared normal. The cord had dried and the umbilicus was negative.

In the abdominal cavity the position of the organs was normal and the viscera showed nothing pathologic. There were two bodies probably hemolymph nodes in the splenic omentum.

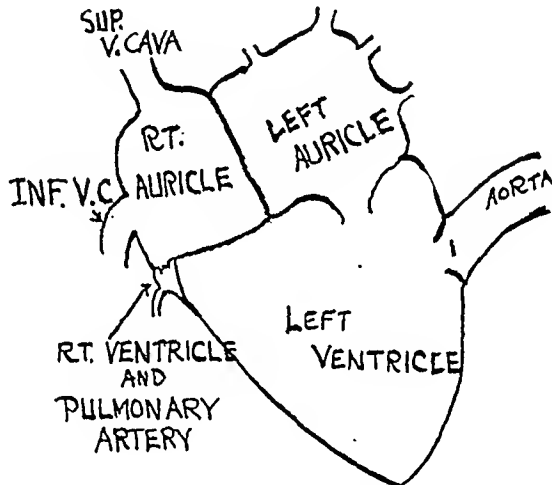


Fig. 2.

There was a moderate amount of pericardial fluid; clear and yellowish. The heart was markedly enlarged and there were subepicardial hemorrhages in the coronary sulci. The heart itself showed left ventricular concentric hypertrophy; the foramen ovale was not patent; the tricuspid valve was completely stenotic measuring 2 mm.; the mitral valve had a hematoma about 3 mm. in diameter near its edge. There was only a vestige of the right ventricle which showed the corda tendinae massed together in a lumen about 3 mm. in diameter. The pulmonary artery was extremely small, about 2 mm. in cross-section.

The lungs were normal and floated in water. The thymus was not enlarged. The brain and cord showed nothing unusual.

Diagnosis was asphyxia due to an aplasia of the right ventricle and the pulmonary arteries.

COMMENT

The probable circulation in this baby during life was from the right auricle to the vestige of the right ventricle into which a slight amount of blood went through a pinpoint opening of the tricuspid valve. From here the blood went into the small pulmonary artery to the lungs where this small amount was oxygenated; thence to the left auricle and through the systemic circulation in the usual manner.

It is possible also that the bronchial artery which normally supplies nutritive blood to the lungs, in this case carried some blood for oxygenation also, which then found its way through the pulmonary veins into the left auricle.

The amount of oxygenated blood was inadequate and we had cyanosis and later asphyxia of which the infant died, as indicated by the subepicardial hemorrhages found at postmortem.

Even had the foramen ovale been patent it would have made no difference in the amount of oxygenated blood in the system circulation in this case.

Lyons and VandeCour: Immunologic Aspects of the Sexual Cycle. Arch. Path. 9: 1, 1931.

The authors in a series of tests with follicular fluids found that those of the sow, cow, mare, and ewe, are closely related immunologically. They found also that these same fluids are closely related to the follicular fluid of the guinea pig. The follicular fluid of the latter is also auto-antigenic. Guinea pigs artificially sensitized to follicular fluid proteins are temporarily desensitized by the liberation of their own follicular fluid. By the Dale-Schultz technic it was demonstrated that normal female guinea pigs become sensitized to their own follicular fluid at certain times during the estrus cycle. Fatal anaphylaxis may be produced at a definite time in normal guinea pigs, on primary injection of heterologous follicular fluid.

W. B. SERBIN.

Vogt, E.: Temporary Hormonal Sterilization of Female Animals by Feeding Insulin. Med. Klin. 15: 1163, 1929.

The author found that he could produce temporary hormonal sterilization in female animals by giving them insulin by mouth as well as by giving them insulin parenterally. This is proof that insulin is absorbed by the intestinal tract and is active after this mode of absorption. Since the female sex hormone in the form of folliculin, menformon and progynon, both experimentally in animals and clinically likewise is active when given orally and since the feeding of insulin to white mice produces temporary sterility without causing any general disturbances, Vogt believes this is further confirmation of his previously expressed belief that the pancreatic, the ovarian and the placental hormones are very closely related. Their action especially coincides in the production of sterility.

J. P. GREENHILL.

American Journal of Obstetrics and Gynecology

GEORGE W. KOSMAK, M.D., EDITOR

HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Editorial Comment

Pediatric Education

SECTION I on Medical Service of the White House Conference was made up of three committees. One dealt with problems of growth and development, another considered the questions involved in prenatal and maternal care, and a third was concerned with the medical care for children. The two last mentioned committees agreed in the conclusion that medical education was in reality the corner stone in any structure which might be erected to care for and improve the child life of the United States.

Some of the reports dealing with the educational problems in obstetrics presented to the committee on Prenatal and Maternal Care were published in the June number of this JOURNAL. At the final conference of the Section on Medical Service held in Washington, D. C., February, 1931, Borden S. Veeder, M.D., the chairman of the subcommittee on Medical Education, presented a noteworthy report dealing with pediatric education which has been published by the Century Company.

In the introduction to this report it is pointed out that the health problem is fundamental in all aspects of child life and that the science of medicine either is the basis upon which all health and welfare work stands or is intimately interwoven with all such projects. "The welfare nurse, the nutritional worker, the psychologist, and the medical social worker, are examples of specialized workers in the field of child health who are directly dependent upon the medical sciences for the basic knowledge of their work."

The fact is duly emphasized that the work with the delinquent, handicapped, school, home, or institutional child cannot be carried on efficiently and effectively without medical advice or supervision. The help and knowledge of the physician is essential for the adequate functioning of these various types of organizations. It must not be forgotten

that while various types of organized health work reach many children, "the vast majority of American children today are dependent upon the interest and care of a private physician for their physical well-being and health."

These considerations led this committee to undertake a study of the teaching of pediatrics and of current practice in the diseases of children.

The data and information which were gathered can be grouped under three main headings:

"A study of the practice of the physician in the field, and his opinion as to the adequacy or inadequacy of his medical school training in pediatrics.

"A study of the position pediatrics occupies in the medical school program, the hours allotted, subjects taught, etc., as well as facilities available.

"The demands and needs for postgraduate instruction and the opportunities available."

Most of this information was secured through the medium of questionnaires.

The number of hours suggested by the Committee amounts to about 8 per cent of the total number of hours allotted to the teaching of the clinical branches, or about two hundred hours. This is about one-fourth of the number allotted to each of the two major branches of medicine and surgery. A similar percentage is advised for obstetrics. It seems to me that the committee has been too modest and that preferably the ratio should have been: medicine is to surgery as obstetrics is to pediatrics, or approximately in the proportion of 2:2:1:1.* The recommendations of the committee are very sane, and while brief, cover the essential points; for these reasons it seems worth while to quote them verbatim:

1. Pediatrics is a fundamental basic clinical subject and should be recognized as such by medical schools. The department of pediatrics should be independent and of equal academic rank with other departments, such as medicine.

2. Adequate teaching staff, hospital and clinic facilities, and laboratories should be provided and adequately financed.

3. The minimum teaching facilities should be:

Fifty beds for infants and children under the control of the head of the department.

Ten bassinets for newly born infants in a maternity hospital or division under the control of the pediatric department.

An out-patient clinic with a ratio of at least ten new pediatric admissions yearly for each student in the senior class.

A well-baby clinic for teaching normal feeding, growth, and development.

Affiliation with a hospital for "contagious" diseases.

Laboratories for routine and research work.

4. The course of undergraduate instruction should cover the following points:

The physical and mental growth and development of the infant and child, and factors influencing them.

*In this ratio medicine is meant to include all medical specialties other than pediatrics; surgery, all of the special surgical branches except gynecology which is included with obstetrics.

The nutritional requirements of infancy and childhood, including the feeding of normal infants and children.

The nutritional diseases of infancy and childhood and their treatment and prevention.

The "contagious" diseases: their recognition, prevention and treatment.

Diseases and pathologic conditions peculiar to early life.

The peculiar manifestations of certain diseases in infancy and childhood.

Environmental and hygienic factors which are important in early life.

Social aspects of pediatrics.

Certain special procedures.

The importance of specific preventive measures.

Certain conditions, the immediate recognition of which is essential to saving lives.

5. Two hundred hours should be the minimum time assigned to pediatrics in the four-year course. This will afford time for ward and clinic work in addition to standardized courses covering the subject. Electives in addition may be offered.

6. The teaching of pediatrics from a pedagogic standpoint should be carefully studied.

7. Intensive review courses (preferably of four weeks) should be continued for postgraduate students and attendance encouraged.

8. The extension courses at present given in some states should be continued, and started in states where they have not been introduced.

Accompanying this report are two leaflets with extracts from its discussion at the Conference. In one of them the author states, "I think as this report indicates, pediatrics should be related to medicine and surgery as one of the three important basic features, fundamental to the medical education of every student in the medical school," and again he adds, "Pediatrics, as I see it, is one of the three basic fundamental departments of medical instruction. It is more important, in many respects, than medicine or surgery. All study of human development must necessarily start at that important period of life, infancy." These statements are interesting, but perhaps should not be taken too seriously or literally inasmuch as they entirely eliminate obstetrics from the field of fundamental knowledge for the medical student. Any medical man knows that reproduction is fundamental and that obstetrics deals with this physiologic process in all its vagaries. Obstetrics* is neither medicine nor surgery nor pediatrics, but surely requires at least a working knowledge of all these in addition to special knowledge in the individual field and should be listed as a special department. The study of growth and development begins, at the latest, with fertilization and not with infancy. Even the most ardent pediatrician should be willing to admit that if obstetrics were nothing more, it at least constitutes an important phase of preventive pediatrics.

The author of the other discussion states, "Since pediatrics deals with every phase of medicine except the disabilities incident to old age, much more space in the curriculum should be given to it than is now allotted to it by most schools." This seems to be a rather specious

*In this discussion obstetrics also includes gynecology.

argument. One might assume that one legitimate theory of education would be that the instruction be given by those most expert in the respective specialties, and one might ask further if the stimulation of interest in a given field and the creation of a desire to know is not more important than the number of hours in the curriculum. It is quite possible that the student might acquire more in a few hours from some teachers, in the way of real stimulation of interest than from others in two hundred hours recommended for pediatrics or any other branch.

It might be seriously questioned as to whether or not the student is burdened with too many required hours of instruction. Too much instruction leaves little time for individual effort and not enough opportunity for thinking. Again, it is not necessarily a foregone conclusion that the subject matter taught should always fall in the same department in different schools. The one on the faculty who knows most about a given subject should teach it irrespective of the department with which he is connected.

There was a definite recognition given by the White House Conference to the importance of obstetrics in relation to child health and protection. It would be exceedingly unfortunate if the remarks made in the discussion of Veeder's report should be taken too literally and too authoritatively. Obstetrics is fundamental and most pediatricians should be willing to admit that the relationship between these two branches of medicine is almost as close as that between mother and child. In education in general, and especially in medical education, the important factors are facilities, and the best type of teachers and students.

Fred L. Adair, M.D.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Endocrinology

Scibelli: Research on the Utero-ovarian Modifications in Experimental Hyperthyroidism. *Arch. Ostet. e Ginec.* 16: 1008, 1929.

In normal rabbits, the thyroid hormone, experimentally used, accentuates the phenomena, first of growth and then of regression of the uterine mucosa; and at the same time one notes strong evidence of maturation of ovarian follicles, and notable hypertrophy of corpora lutea. In castrated rabbits, the findings are disorderly possibly due to alterations brought about by castration. This leads the author to think that thyroid and a specific hormone of the ovary regulate between themselves the rhythmic uterine cycle.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Arbuzese: Thyroid Function in the So-called Essential Metrorrhagias. *Riv. Ital. di Ginec.* 8: 5, 1929.

Nearly all investigators admit the existence of an ovarian-thyroid antagonism, expressed in hyperthyroidism during pregnancy, in climacterium and following castration, that is, ovarian hypofunction leads to thyroid hyperfunction. The ovary has hypotensive and the thyroid hypertensive activity. The ovary may cause bradycardia, the thyroid a tachycardia. The antagonism manifests itself chiefly in the sexual functions. Admitting such antagonism, in cases of metrorrhagias a primary hyperovarism might be succeeded by hypothyroidism.

In the last analysis there are at least two types of pubertal metrorrhagias, one connected with primary hyperovarism followed by thyroid hypofunction, and another with constitutional hypothyroidism preceding sexual development.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Gilardino: Folliculine and Thyroid. *Riv. Ital. di Ginec.* 11: 3, 1930.

Folliculine, administered subcutaneously to animals is very well tolerated and causes no disturbances even when administered for a long time.

Besides the well known modifications of the genital organs it has the property of bringing about distinct hyperemia of the parenchymatous organs and hypertrophy of the thyroid.

The thyroid hypertrophy observed in pregnancy must be attributed to the greater quantity of follicular hormone.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Paroli: Research Studies and Clinical Results on Diathermy of the Thyroid on the Essential Metrorrhagias. *Arch. di Biol. Norm. e Patol.* 84: 1, 1930.

In the metrorrhagias of puberty one often observes a functional deficiency of the thyroid. After the diathermic treatment of the thyroid greater activity of this gland is noticed while at the same time the metrorrhagias improve and eventually cease. Such improvement lasts only three or four months.

In all cases of metrorrhagia near the climacterium sterilizing Roentgen or radium therapy is preferable.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

Abruzzese: The Functional Status of the Thyroid in the Pathogenesis of Abortion. *Riv. Ital di Ginec.* 10: 1, 1929.

An endocrine abnormal function of the thyroid constitutes, probably very often, the pathogenic substratum of certain abortions whose pathology is obscure. Both hypo- and hyper-thyroidism seem to disturb the evolution of pregnancy, hyper-thyroidism especially in early pregnancy and in the pluripara. This might be interpreted as a precocious and exaggerated awakening of the pregnant hyper-activity of the thyroid at the second half of pregnancy.

A functional examination of the thyroid made promptly in cryptogenic abortions is indicated, since it might lead to an opportune therapeutic finding, both for prevention and cure.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

Fahrni, Gordon S.: Pregnancy Complicating Hyperthyroidism and Following Thyroidectomy. *Canadian M. A. J.* 23: 645, 1930.

The author recommends thyroidectomy for those less than five months pregnant as there is little increased risk. After the fifth month operation should be deferred until after delivery. Pregnancies should be avoided for two years. Therapeutic terminations have no place because they are associated with greater danger than the other forms of treatment.

H. C. HESSELTINE.

Hartley, E. C.: The Tetanoid Syndrome in Pregnancy. *Minn. Med.* 13: 190, 1930.

Another case illustrating the tetanoid syndrome in pregnancy is reported by the author. The patient was a para x, 36 years old, and presented edema of the extremities, insomnia, irritability, crampy pains, and paresthesias that make up the syndrome. Administration of parathormone and calcium produced striking and immediate relief. The condition is probably due to a relative hypocalcemia.

FRANK SPIELMAN.

Stevens, Neil Campbell: The Thyroid and Headache at the Menopause. *New Engl. J. Med.* 201: 168, 1929.

It appears that there is a definite complex occurring in women between the ages of forty-five and sixty, which is characterized by headache, fatigue, nervousness, subnormal temperature, dry skin, sensitiveness to cold and a low or subnormal basal metabolic rate. Such patients are benefited by the administration of thyroid extract.

EHRENFEST.

Schultze-Rhonof and Niedenthal: Researches Concerning the Hormonal Value of the Anterior Lobe of the Fetal Hypophysis in Animal Experiments. *Zentralbl. f. Gynäk.* 53: 902, 1929.

In an attempt to prove the presence of the anterior pituitary hormone in the pituitary body of human and cattle fetuses, the authors implanted anterior lobes of 25 human and several cattle fetuses in infantile mice. The typical reactions of opening of the vagina, enlargement of both horns of the uterus, and follicle formation in the ovaries, were observed in all cases. They, therefore, believe to have proved the presence of the anterior pituitary hormone in the fetus.

WILLIAM F. MENGERT.

Philipp, E.: Anterior Pituitary and Placenta. *Zentralbl. f. Gynäk.* 54: 450, 1930.

The author believes that the pregnancy reaction of Aschheim-Zondek is in reality a placental reaction. To support this view he submits the following evidence: The chorionic villi of a human tubal pregnancy of two or three months were implanted into infantile mice and without a single exception all showed an enormous change in the ovaries similar to the changes obtained in the AZ reaction. Amniotic fluid, the amnion itself from an early pregnancy, and decidua everted from a case of tubal pregnancy, gave a similar, but not so strong, reaction. Similar injections and implantations into castrated mice gave no reaction of estrus. Placental implantations of early abortions gave positive tests in cases which had showed a positive AZ reaction, and negative tests in cases which had showed a negative AZ reaction. Implantation of placentae from patients at term gave a very weak reaction discernible only on microscopic serial sections. Direct implantation into mice of anterior pituitary lobes taken directly from 4 patients, 3 of whom died postpartum after term pregnancies, and one who died after abortion in the third month, gave no ovarian change. However, implantation of 3 anterior pituitary lobes taken from nonpregnant women did give typical changes, i.e., follicular bleeding and corpora lutea atretica. The author hesitates to draw too many conclusions from a research which is just beginning, but he does state quite positively that the Aschheim-Zondek reaction results from products of pregnancy and not from the anterior lobe of the pituitary gland.

WILLIAM F. MENGERT.

Scaglione: Fibroma of the Uterus and Hypophysis. *Arch. Ital. di Ginec.* 11: 2, 1930.

It is noteworthy that fibromas develop: (1) Only exceptionally before puberty and after the menopause. It is therefore a tumor that coincides with the greatest activity of the ovary. (2) After menopause many fibromas undergo retrograde changes. (3) Histologic analogies exist between uterine hyperplasia in pregnancy and localized hyperplasia of the foci of myomas. (4) The fibroma is rare in the neck of the uterus, a region not participating in ovarian growth activity. (5) The fibroma is frequent in sterile females.

Existing relations between ovary and hypophysis can be thus demonstrated: (1) The total ablation of the anterior lobe of the hypophysis in immature animals leads to a cessation of development of ovary and uterus. (2) Total ablation of the anterior lobe of the hypophysis in mature animals leads to a rapid diminution of the weight of the ovary with stoppage of the maturation of graafian follicles and of ovulation, with disappearance of the corpora lutea. At the same time the uterus undergoes atrophic changes with cessation of its cyclic activity. (3) The homo- and the hetero-transplant of hypophyseal tissue in animals deprived of hypophysis leads to an increase in weight of the ovary, a return of functional activity and an

increase in the volume of the uterus. (4) Transplants of hypophyseal fragments to immature animals lead to a rapid increase in weight of the ovary, an increase in the graafian follicles and to a considerable hypertrophy of the uterus.

These and other factors would justify the conclusion that the hypophysis exercises a direct effect on a fibroma, possibly since it modifies ovarian activity.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Candela: Follicular, Luteinic and Mammarian Incretotherapy and Its Influence on the Genital Tract and on the Endocrine System. Experimental Study. Arch. Ostet. e Ginec. 17: 97, 1930.

The author from studies on guinea pigs treated with follicular, luteinic and mammarian extracts, arrives at the following results:

The follicular extract is responsible for a more accentuated development of the genital tract, the maturation of the ovarian follicles and the prolongation and intensification of the estrus cycle; the other extracts may determine alterations in the rhythm of the estrus cycle or else in its suppression; the mammarian extract may lead to atrophy of the ovary and of the genital tract. The thyroid and the mammary gland are slightly hypertrophied with the follicular extracts, this condition is more marked with luteinic and mammarian extracts.

Notable hypertrophy is also obtained in the suprarenals and in the hypophysis by the action of the follicular and mammarian extracts. With the luteinic extracts, on the other hand, there is obtained atrophy of the hypophysis and moderate hypertrophy of the suprarenals.

Finally, the luteinic and mammarian extracts lead to an increase in weight of the animal, but confer sterility; the follicular extract has no influence on the body weight and augments fecundability.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Biseeglie: The Effects of Hyperhormonization With Follicular Liquids on Hypophysis, Thyroid and Suprarenals. Endocrinol. e Patol. Costit. 5: 70, 1930.

The results obtained with the administration of follicular liquid are: (1) Hypophysis (anterior lobe) modifications are seen which augment in intensity parallel to the follicular liquid administration. These modifications consist in hyperemia with a constant increase of the acidophilie, disappearance of the basophilie cells and some increase of colloid. (2) There is a gradual reduction of the volume of the thyroid cells, showing a smaller quantity of colloid, and a notable hyperplasia of the intercellular epithelium.

(3) With short treatment no defined changes are seen in the suprarenal cortex. With longer administration of the liquid, there is a slight hyperemia, changes in the spongy tissue in the zona reticulata and fasciculata, with considerable increase in these zones of lipid substances. In the medullar region no appreciable changes are observed.

SYDNEY S. SCHOCHET.

JULIUS E. LACKNER.

Siegmund: The Dependence of the Uterine Musculature Upon the Function of the Ovary. Arch. f. Gynäk. 140: 573 and 583, 1930.

The author based his studies on the investigations of Knaus who found by experiments on rabbits that the corpus luteum hormone inhibits the effect of the pituitary hormone upon the uterine musculature. Siegmund finds that this relation-

ship does not hold for the rat. There probably is a difference in the corpus luteum of the rabbit and that of the rat. The corpus luteum is indispensable in the rat as well as in the rabbit, for its removal always causes fetal death. The difference in sensitivity to pituitary hormone as demonstrated to exist in rabbit and rat is new evidence of varying and often opposite reactions of the same organs in different species to the hormones of similar organs.

RALPH A. REIS.

Knaus, H.: Physiology of the Corpus Luteum. Arch. f. Gynäk. 141: 374, 1930.

The author has conducted a large series of experiments and studies of the reproductive functions of the rabbit with special reference to the corpus luteum. He concludes: False pregnancy in the rabbit lasts sixteen days. The corpus luteum thirty-two hours postcoitum produces changes in the uterus which prevent the latter from reacting to the posterior pituitary extract. The corpus luteum stimulates a marked hypertrophy and hyperplasia of the endometrium and the mammary glands. It also inhibits the follicle ripening and ovulation. Removal of the corpus luteum stops all these reactions. It requires about ten hours for the uterus to react to pituitary extract following extirpation of the corpus luteum. In pregnancy, in the rabbit, the corpus luteum activity begins to decrease on the eighteenth day but some function persists until just before delivery, which usually occurs on the thirty-second day. The stimulation of the uterus and the mammary glands by the corpus luteum of pregnancy is more marked than in false pregnancy. This difference in reaction is demonstrable on the tenth day postcoitum, and thus the true corpus luteum can be differentiated from the false. The latter becomes a true corpus luteum of pregnancy only through the stimulation of the hormone of the ovum. The corpus luteum prevents the entire pituitary gland from exciting any influence on the female genitalia. The cyclic character of the ovarian function is dependent upon the corpus luteum.

RALPH A. REIS.

Brande and Schwarzmann: The Effect of Iodine on the Ovary. Arch. f. Gynäk. 138: 782, 1929.

The authors studied the effects of continued and repeated administration of iodine on female experimental animals. In each instance one ovary was first removed and studied as the control. The iodine was then given by hypodermic over varying periods of time and in varying dosages. The second ovary was then removed and examined grossly as well as microscopically. They found that in mature animals, iodine produces destructive changes in the ovary manifested by degeneration and destruction of the follicular apparatus. The extent of this destruction depends not so much upon the amount of iodine administered as upon the length of time during which it is given. The cyclic changes in the vaginal mucosa of mice are lost and the iodinated animals are sterile. None of these results could be obtained by the injection of foreign protein.

RALPH A. REIS.

Bruehl: The Occurrence of the Female Sex Hormone in the Blood and Urine of the Newborn. Klin. Wchnschr. 8: 1766, 1929.

The female sex hormone is found in the blood and the urine of the newborn irrespective of sex. It is found for the first four days of extrauterine life and is also constantly present in the amniotic fluid and in the umbilical cord blood. On the other hand, the hormone of the anterior lobe of the pituitary is found in the urine of the newborn for only the first two days and then in only approximately

50 per cent of the babies. This pituitary hormone is always demonstrable in umbilical cord blood but only in very small amounts. In milk its presence was only demonstrated in one instance and it was never found in the amniotic fluid.

Animal experiments show definitely that the female sex hormone disappears from the body as the glands of the breasts become active. The female sex hormone most probably disappears from the newborn for the same reason, viz., the activation of the secretory glands of the breasts.

RALPH A. REIS.

Siegert: The Results of Ovarian Transplantation After Loss of Both Ovaries.
Med. Klin. 25: 1845 and 1884, 1929.

Nine women between the ages of twenty-three and thirty-seven had their ovaries removed chiefly because of inflammatory conditions, but their uteri were left. In all of them autoplasmic transplantation of the ovaries was performed and the site of implantation was the anterior rectus fascia. These patients were closely followed by Siegert and he came to the conclusion that in most cases of ovarian transplantation there is a more or less rapid disintegration of the ovarian tissue. In the cases studied there was neither a return of the regular menses nor an amelioration of menopausal symptoms.

J. P. GREENHILL.

Aschner, B.: Menstrual Disorders as Causes of Disease. II. Joint Diseases Resulting From Too Infrequent or Scanty Menstruation. *Wien. klin. Wchnschr.* 42: 322, 1929.

As stated in a previous paper, menstruation in normal quantity at regular intervals of 4 weeks is a necessity for the healthy woman. Whether it is associated with ovarian secretion, as most authors believe, or whether the flow represents an excretion following metabolic changes, as Aschner believes, is of secondary importance. However, it has been shown repeatedly that too infrequent or scanty menstruation in younger women as well as the production of an early artificial climacterium has been accompanied by obesity, plethora, susceptibility to infections and metabolic changes, dyscrasias in the truest sense of the word.

Of 700 hypomenorrhoeic patients, 230 (about one-third) showed arthritic-rheumatic-neuralgic conditions, 74 of whom had joint pains whose severity depended definitely on the quantity of blood lost at menstruation.

The ovary plays a part in the process, which is complicated and little understood; certainly ovarian therapy is not nearly as efficacious as the author's treatment consisting in emmenagogues, and antidyscrasia, especially antiarthritic measures.

All the arthropathies, which the author divides into 4 groups, (a) painful joints with and without swelling or deformity, (b) a combination of joint pains with rheumatic pains in muscles, ligaments, and tendon sheaths, (c) joint affections plus neuralgic conditions, (d) a combination of the above three, are accompanied with surprising frequency by hypomenorrhea. Careful questioning of the patients also elicits the information that these pains are worse before, and better after menstruation. The relationship is best brought out, however, by the frequency of joint affections when menopause is produced artificially. Accompanying metabolic disturbances tend to favor a kind of auto-intoxication, and are prone to improve when the "blood clearing" measures are instituted.

Aschner's treatment consists in: (1) The use of strong emmenagogues—tincture of aloes, up to 30 min. three times a day; infusion of senna, and Ruffi's pill (a mixture of aloes, myrrh, and crocus) are especially recommended. (2) Measures help-

ing elimination through intestines and kidneys. (3) The strongest measures promoting elimination through the skin—the cantharides plaster is here mentioned as particularly efficacious.

In concluding the author proposes “arthropathia hypomenorrhoeica” as a term characterizing the above conditions.

FRANK SPIELMAN.

Lauber and Ramm: *Prognosis and Therapy of Arthropathia Ovaripriva*. München. med. Wehnschr. 77: 89, 1930.

The authors describe a type of joint affection, which develops during the menopause and is directly attributable to lack of ovarian hormone. They comment on reports of joint lesions, attributed to hyperthyroidism and other endocrine disturbances. Arthropathia ovaripriva is characterized at first, by tingling and pain, particularly in the small phalangeal, and later in the carpo-metacarpal joints, and finally in the knee-joints. These symptoms are particularly noticed when the patient moves from cold outdoor temperatures into a warm room. They are probably due to vascular spasm. Objectively, the joints are found thickened and slightly swollen. Motion, active and passive, is limited and painful. There are no signs of acute inflammation. X-ray shows very little in early cases; in late cases, changes similar to those of arthritis deformans are seen.

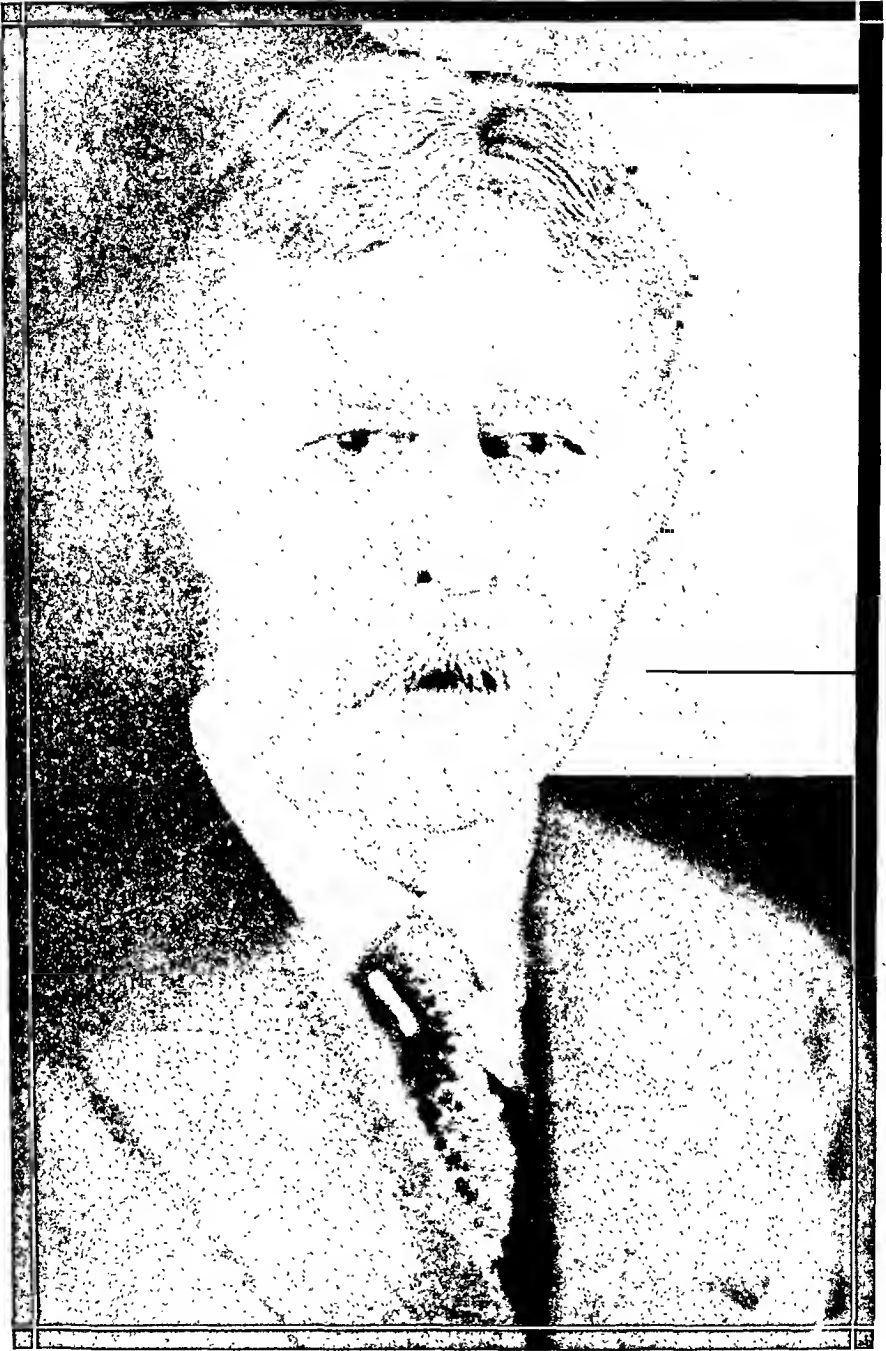
The important feature of the treatment is the administration of an active ovarian hormone. In 6 early cases, the authors obtained cures by giving such a preparation by mouth (Ovoglandol or Menformon-Laqueur), in addition to potassium iodid and alternate hot and cold baths. Improvement was evident in three to six weeks, and complete cure in six to twelve weeks. Three late cases were improved, but not cured, by these measures plus baking, massage, diathermy, etc.

A. SHULMAN.

ITEM

American Board of Obstetrics and Gynecology

The next written examination for Group III candidates for certificate from this Board will be held in 18 cities of this country and Canada on Saturday, October 31, at 2 P.M. The clinical examination for all candidates will be held at the Chicago Lying-In Hospital, Chicago, Ill., on Tuesday, December 29, at 9 A.M. For further information address the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Pa.



JOHN WHITRIDGE WILLIAMS
1866-1931

American Journal of Obstetrics and Gynecology

VOL. XXII

ST. LOUIS, NOVEMBER, 1931

No. 5

IN MEMORIAM

DR. JOHN WHITRIDGE WILLIAMS

1866-1931

ON OCTOBER twenty-first American medicine lost one of its most outstanding figures, for on that evening occurred the death of John Whitridge Williams, revered and loved by American and European obstetricians and gynecologists, and respected and admired by the entire profession. The shock of his sudden and unexpected death has cast a shadow over Johns Hopkins and over his immediate associates, and has kept them from a full realization of their tremendous loss. One cannot write of him as of one who belongs to the past; his overwhelming personality and far reaching influence seem as real today as ever before.

Dr. Williams was born in Baltimore, January 26, 1866, the son of Doctor Philip C. and Mary C. Whitridge Williams. His grandfather, Dr. John Whitridge, settled in Baltimore in 1820, while his great-grandfather, Dr. William Whitridge, began the practice of medicine in Rhode Island in 1770. At the age of twenty Dr. Williams graduated from Johns Hopkins University with a bachelor of arts degree, and at twenty-two he received his medical degree from the University of Maryland. In 1888, soon after graduation, he went to Europe to attend universities in Berlin, Leipzig, Prague, Vienna and Paris. On his return he joined Dr. Howard A. Kelly's department and in 1893 was appointed professor of obstetrics at John Hopkins; six years afterward he was made Obstetrician-in-chief to the Hospital. Later he succeeded Dr. Howell as dean of the medical school and functioned in this capacity for thirteen years, resigning in 1923 in order to devote all his time and energy to his chief interest, the Woman's Clinic.

His contributions to the science of obstetrics are too well known to the readers of this JOURNAL to need further elaboration. It may suffice to mention his outstanding and revolutionary work in syphilis during pregnancy, his fundamental studies in placental infarcts, his publications on chorioepithelioma, his pioneer work in antenatal care, and his studies on contracted pelvis and pelvimetry in general.

His conservative teachings in the use of cesarean section and his profound knowledge of and contributions to obstetric pathology are best illustrated in his most recent work on the postpartum changes in the uterus at the site of the placental implantation which was presented last May before the American Gynecological Society, of which he was President in 1913. One cannot refrain from mentioning his well-known textbook on obstetrics, which so well exemplifies his scientific mind; in his treatment of obstetrics as a biologic science he did not allow the clinical aspect to suffer.

Of his personality and character much could be written. He was a sensitive man, so sensitive indeed that to the outside world he gave the impression of gruffness. But no one who knew of his kindly acts, especially toward needy students and younger graduates, ever doubted that the manner was but the mask of an extraordinarily generous spirit. He was a tireless worker and established a routine for every day, week and month, from which he very seldom swerved, and which, according to his assertion, he built up to overcome his own inertia. With a profound dislike for personal publicity he combined a modest appreciation of the personal compliments of those he respected and liked, and was always accessible to his associates and friends.

No estimate of Dr. Williams would be complete without touching upon his qualities entirely unrelated to medicine. He was eminently a citizen of strong convictions and a gentleman of the older tradition in which he grew up. He believed in local as opposed to national government and was ready at all times to support the State as against federal authority. He had no belief in the virtues of the material or mechanical devices with which the modern age abounds and, in fact, maintained firmly that a better life was actually realized by people under the simple conditions prevailing in his youth than in the complex conditions of today, overloaded with radios, movies, labor-saving devices and jaded nerves.

The tradition in which Dr. Williams grew up required that a gentleman should be educated, and education for him included not merely a working knowledge of a single science, but a broad interest in literature, an ability to write the English language well, a familiarity with other languages, and a sense of history. A lover of old books, he made a collection of ancient medical works which he bequeathed to Johns Hopkins University. Within the last three years he spent a considerable part of his vacation in perfecting his Latin, in order to read more fluently certain old treatises which he had acquired.

In conversation he was a most welcome companion. While his tendency was to listen, his keen appreciation of many subjects made him a most trenchant and often a most spicily humorous critic. His was a personality which combined a strong intellect with a strong body and a strong will. Masculinity and power radiated from him and all who knew him felt his profound honesty and were inspired by his un-

daunted striving toward that goal which seemed to him to be the right one. Of all his qualities this dynamic sincerity was one of his most salient characteristics.

His first care on taking charge of the department of obstetrics at the Johns Hopkins Hospital was to organize and develop it along scientific lines, to reproduce in his wards all of the inquiring spirit which had placed German medicine in the lead. One of his life ambitions was to build up at the Hopkins a complete Woman's Clinic, or "Frauenklinik." In this he was successful and American obstetrics must acknowledge a great debt to him.

Perhaps the most noteworthy contribution made by Dr. Williams, as dean of Johns Hopkins, was his backing and support of the full-time principle for the teaching staff of the Medical School. No move of his aroused more opposition, but no move aroused more enthusiasm among his friends and supporters. The controversy still lives; nevertheless "full time" is established, however modified it may be in detail. As a principle it appears to have earned a permanent place in medical schools of the first rank.

Dr. Williams himself would have been the first man to deny that he had himself effected these changes. He was strongly supported by his colleagues, but his was the moving spirit, the energy that bound his friends together and made it possible to carry through these plans.

Dr. Williams, together with the other members of that group of men who shaped the early life of the Johns Hopkins Medical School, brought world-wide fame and distinction to that institution. As the years roll by this group is gradually dwindling in number, and we of the younger generation wonder whether their places can ever be filled. It was truly a unique group, to which medicine owes a debt that can never be paid and the name of Dr. Williams is permanently written in its annals and in the annals of obstetrics. May his great personality, his intellectual courage and honesty, and his scientific spirit not die, but lead his successors and his pupils to carry on the work which he began.

—H. J. Stander.

To the foregoing memorial of Dr. Williams by one of his associates and coworkers, the editors of the JOURNAL desire to add an expression of their personal appreciation of his deep interest in this publication. He was a frequent contributor to its pages and what we believe to be his last scientific paper is included in the present issue. Dr. Williams was an active member of the Executive Committee of the Advisory Editorial Board of the JOURNAL since its organization and was always ready with valuable counsel and practical help when called upon. The JOURNAL has been honored by this association with a man whose achievements in obstetrics have been outstanding and whose exalted position in the annals of American medicine is assured.

Original Communications

REGENERATION OF THE UTERINE MUCOSA AFTER DELIVERY, WITH ESPECIAL REFERENCE TO THE PLACENTAL SITE*

BY J. WHITRIDGE WILLIAMS, M.D., BALTIMORE, MD.

(From the Department of Obstetrics, Johns Hopkins Medical School)

ACCURATE statements concerning the process of regeneration following labor could not be expected until the nature of the decidua lining of the uterus was clearly understood, nor until histologic technic had become so developed as to make possible preparations which could not be misinterpreted.

In general, our knowledge may be said to start with the fundamental monograph of Friedländer written in 1870, although William Hunter a century previously had stated "that the decidua is an efflorescence of the inner coat of the uterus itself, and is therefore shed as often as the woman bears a child or suffers a miscarriage. It is of considerable thickness, and one stratum of it is always left upon the uterus after delivery, most of which dissolves and comes away with the lochia." Such views, however, did not obtain universal acceptance, as is indicated by the fact that Cruveilhier, Dubois and others taught that the entire lining of the uterus was thrown off at the time of labor, leaving the muscle exposed. More accurate knowledge slowly developed, and Coste and Robin in the fourth decade of the last century thought that a new mucosa began to develop during the fourth month of pregnancy, and took the place of the old one after delivery. Furthermore, they taught that the cervical mucosa was never cast off.

Heschl in 1852 studied in some detail the processes involved in the involution of the puerperal uterus, but knew little about the regeneration of its mucosa. In general, he held that it was not completed until the uterus had returned to its original size, and that regeneration of the placental site required still longer. He stated that the latter was characterized by the presence of large thrombosed vessels and was the size of a "thaler" at the sixth week. Furthermore, he noted that "the vessels which lie in the depths of the uterus are distinguishable for a long time, and perhaps for ever, by their thick walls and large size." Consequently, he may be regarded as having begun the controversy

*Read in abstract before the American Gynecological Society, May 18, 1931.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

which has continued to the present time, concerning the nature of the vascular changes which occur during and after pregnancy. It might also be noted that Matthews Duncan in 1863 revived the Hunterian views in England.

As has already been indicated, our knowledge really started with Friedländer, who in 1870 accurately described the decidua with its compact and spongy layers, and pointed out that at the time of labor separation occurred in the deeper part of the former, so that the entire spongy layer was retained, from the fundi of whose glands the new mucosa is restored. He also demonstrated that outside of the placental site the mucosa was completely restored by the fourth week, but not until several weeks later at the placental site. He pointed out that the essential feature of the latter consisted in the presence of thrombosed vessels which undergo organization, and he believed that the process originated during the last weeks of pregnancy as the result of hyalin degeneration of the walls of the vessels in the decidua basalis, which were invaded by fetal cells. He apparently, however, had no idea as to how the organized thrombi were eventually gotten rid of.

In 1873 appeared the article of Kundrat and Engelmann, which is of interest from several points of view. In the first place the authors recognized the fact that the uterine mucosa is constantly undergoing a series of cyclical changes, and so almost anticipated the work of Adler and Hirschmann upon which our current views are so largely based. In the second place, by the study of a large number of specimens, they made a fundamental contribution to the changes which occur in the decidua during pregnancy and the puerperium. They showed that outside of the placental site the uterine mucosa becomes completely regenerated during the third week of the puerperium, at which time the placental site is not yet covered by epithelium. Furthermore, it is interesting to note that with the exception of a trifling contribution by Wheeler, Engelmann is the only American who has contributed to the subject under discussion.

In 1875, Langhans, to whom we are indebted for much information concerning the placenta, pointed out that the decidua really consists of three layers, and that, in addition to the two layers described by Friedländer, there is a third or basal layer immediately adjoining the muscularis, in which the glands and stroma cells preserve their pre-gravid structure. Furthermore, he insisted that at the time of labor separation occurred in the spongy layer, and not in the compacta as Friedländer believed, so that part of the spongy and all of the basal layer remain in situ, and that it is in great part from the latter that the new mucosa is derived. He contended that regeneration occurs in the same way at the placental site, so that one does not have to deal with a raw wound, but rather with a surface in great part covered by epithelium.

A year later, DeSinéty wrote upon the subject, and, while admitting that the uterus after delivery was lined by decidua, he contended that it contained no glands nor epithelial structures. Accordingly, he was compelled to assume that the epithelial cells of the regenerated mucosa had developed from embryonic cells.

In 1878 Leopold's *Studies on the Uterine Mucous Membrane* appeared, which, together with Friedländer's monograph, constituted the basis of our knowledge for many years. It consisted of three parts, the third of which, dealing with the changes in the mucosa during the puerperium, is of particular interest to us. Leopold agreed with Friedländer that during the eighth month of pregnancy many vessels at the placental site undergo hyalin change and are invaded by serotinal giant cells, which lead to complete or partial thrombosis, and he believed that the resulting interference with circulation played an important part in the causation of labor. After expulsion of the placenta, these vessels constitute a part of the thrombi which characterize its site, while additional thrombi develop during the first days of the puerperium. Both become organized, and are broken up into smaller and smaller portions by invading vessels and eventually disappear.

Outside of the placental site, he held that the superficial part of the retained decidua underwent necrosis and was cast off, while the new mucosa was regenerated from the glandular epithelium and stroma cells which remained, the process being completed during the third week. As he could not see mitotic figures, he held that cell division must occur by the direct method. At the placental site, regeneration was not completed until the sixth week, and as very few glands remained in the decidua basalis, he held that new ones were derived from serotinal cells, which had extended between the muscle bundles. Careful study of this valuable monograph failed to show that Leopold had any idea of such exfoliation of the placental site, as will be described in the latter part of this article.

The following year, Patenko wrote upon "the physiological thrombosis of the uterine vessels during pregnancy," and held that the cells which Friedländer and Leopold had observed in the uteroplacental vessels were derived from endothelium, and consequently were not fetal or serotinal giant cells. This article is of interest, as it represents the first of a large series having to do with a question which has not yet been settled.

In 1887 Mayor contributed a histologic study on uterine involution, and, while it was chiefly concerned with the changes occurring in the muscularis, it contained several statements of interest in connection with our problem. In the first place, he was one of the first writers to mention changes in the elastic tissue of the uterine vessels, which persist long after labor. Furthermore, he held that regeneration of the mucosa was not completed until the second month, and even so

late as the twenty-fourth day postpartum that he was unable to find a gland at the placental site. Finally, he stated that unless studies were made upon normal uteri, the conclusions would probably be incorrect.

The same year Peter Müller voiced a similar complaint, and held that our imperfect knowledge concerning the changes at the placental site was due to the fact that most of the specimens studied had been obtained from women who had died from infection. He predicted that the problems would not be solved until a series of specimens was obtained from normal women, and one of the objects of the present paper will be to fill that lack.

Klein in 1891 wrote a long-winded article upon the decidua, and, while he said nothing about the placental site, stated that the new mucosa was regenerated from fragments of decidua included in the interstices between the muscle bundles, and held that it might occur as early as the third day postpartum. On the other hand, he stated that following abortions no tissue was cast off, but that the necrotic material was absorbed and what was left became converted into normal mucosa within five or six weeks.

One of the most important early articles came from Emil Ries of the Strassburg Clinic in 1892. Its first part dealt with clinical observations concerning involution of the uterus, the patency of the cervix and the persistence of the lochia and does not especially concern us. The second part was based upon the palpation of the placental site in 36 normal women up to the twelfth day postpartum, as well as upon the histologic examination of tissue removed by means of the finger. Ries pointed out that the irregular surface of the placental site is due to projecting thrombi, and that upon microscopic examination muscle cells, decidual cells, glands, and obstructed vessels with hyalin walls could be found. On page 85 he described the fate of the placental site as follows: "When the placenta separates many vessels are opened up, which were already more or less thrombosed, but which still contain blood. A portion of this blood does not immediately escape, and finds in the existing thrombi sufficient substances to cause coagulation. A certain 'nutrient stream' in small spaces hinders the immediate casting off of the clots, which is eventually brought about by epithelium from glands gradually spreading over the surface, and by the glands beginning to secrete again, so that eventually a layer forms between the mucosa and the clot, detaches it from its base and causes its exfoliation, often in masses of considerable size."

As will be seen later, this description is suggestive of the mechanism which I shall describe, and is unique as far as I can find in my survey of the literature. The fact, however, that Ries' observations ceased on the twelfth day postpartum necessarily makes them far from complete,

and he emphasizes the necessity for obtaining specimens from uninfected and normal women.

The same year Webster published his *Researches in Female Pelvic Anatomy*, in which he described a number of early puerperal uteri, and gave excellent gross pictures of the placental site. However, as nothing was said regarding their histologic structure, his observations are valueless for our problem.

In 1895, Werth made his important contribution upon the regeneration of the uterine mucosa after curettage. This was based upon the histologic examination of uteri extirpated at varying periods after that operation. He noted the extreme rapidity with which the new mucosa is regenerated, and demonstrated that it was effected by the proliferation of the tissue left in the interstices between the various muscle bundles. Werth's investigations were of fundamental importance and will be referred to again.

During the next few years articles appeared from Pels Leusden, D'Erchia, and Aschoff on the part played by the so-called serotinal giant cells in the regeneration of the placental site. The former directed attention to the giant cells which are found in the decidua basalis and in the superficial portion of the muscularis beneath the placental site throughout pregnancy and during the first part of the puerperium, but which usually disappear after the first week. Leusden held that there were practically no glands in the decidua basalis, and that the giant cells play an important part in affording a basis for the glandular structures which later develop. D'Erchia strongly opposed that view, but in other respects his article is of interest only in the fact that the subsequent investigation has proved that practically every statement he made was incorrect. On the other hand, Aschoff's article has stood the test of time. He held that the syncytial giant cells are of fetal and not maternal origin, and take no part in the formation of glands at the placental site. Furthermore, he contended that there are always sufficient glands in the retained portion of the decidua basalis to effect regeneration, and consequently that it was unnecessary to seek other explanations for their production. In other respects, his article does not affect our problem, as he did not take into consideration the mode by which the placental site eventually disappears.

In 1901 Krönig published an important article upon placentation and the behavior of the uterine mucosa during the early puerperium, which was based upon normal material and was well illustrated. He pointed out that while separation of the placenta and membranes usually occurs in the spongy layer of the decidua, yet it does not occur as schematically as described in the literature; he showed that the amount of decidua retained varies greatly, consisting in some places only of a few layers of cells, while in others portions of spongy layer

measuring several millimeters in thickness are retained. He insisted that at the placental site enough mucosa is always retained to insure regeneration of the new membrane, while in the cervical region the mucosa remains practically intact. He held that regeneration of the main uterine mucosa is completed by the eighteenth day, but requires a longer time at the placental site. Naturally, he mentioned thrombosed vessels in the latter location, but gave no information as to how they are eventually gotten rid of. Furthermore, he gave an excellent picture of the chorionic giant cells in and beneath the placental site, and expressed the opinion that they usually disappear by the fifth day of the puerperium. Finally, he held, contrary to most writers, that puerperal infection does not interfere with or delay the regeneration of the mucosa.

The following year Wormser's long article appeared, which was based upon the examination of 7 uteri, and of tissue removed from 36 women by curettage, and from 4 others by manual removal of material from the placental site. He held that regeneration outside of the placental site was usually complete by the fourteenth to seventeenth day, and directed attention to peculiar degenerative changes occurring in the epithelium, as well as to the absence of mitosis for at least the first two weeks. He mentioned the thrombosed vessels at the placental site without details as to their disappearance, but in general he gave the impression that its regeneration was effected in essentially the same manner as elsewhere.

In the literature Wormser's article is generally regarded as being very fundamental, but, except for the fact that a more refined histologic technique was employed, his findings scarcely appear superior to those of Friedländer, Leopold, or Ries.

The subject lay fallow for the next seven years, until the appearance of Goodall's monograph in 1910, which was followed in quick succession by contributions by Frankl and Stolper, Schiekele, Hinselmann and others. All of these articles dealt with the vascular changes occurring at the placental site, as well as elsewhere in the uterine wall, and it would lead too far afield to attempt to discuss them in detail, as they have only an indirect bearing upon our problem.

Goodall's extensive monograph on the involution of the puerperal uterus was in great part confined to the study of the uterine vessels by means of Van Gieson's and Weigert's elastic stain. He believed that as a result of the greatly diminished need for blood after delivery all the vessels of the puerperal uterus undergo important changes, and particularly those in the inner and middle thirds of the muscularis, and particularly beneath the placental site. He holds that all of the arteries are renewed after each pregnancy, and that this is effected by the building of a new and much smaller vessel within the lumen of the old one. Following this, the rest of the vessel undergoes

hyalin and elastoid degeneration and in young women is rapidly and entirely resorbed, whereas in older women the process is slower and less complete. While Goodall's study has added materially to our knowledge of involution of the uterus, I do not believe that it tells the entire story, as I am confident that many vessels become entirely obliterated and absorbed, without the formation of new ones in their interior.

Schickele limited his study to the changes occurring in vessels at or near the placental site. He pointed out that as the result of invasion by trophoblastic cells their walls undergo hyalin degeneration and thereby become more plastic. As a result, they are more readily compressed by the contracting and retracting muscle whereby hemostasis is assured, and at the same time the way is prepared by their eventual absorption. Such a process, of course, differs materially from the sclerotic changes described by Pankow, Goodall and others, and he held that it constitutes an essential feature in the story of the placental site.

Hinselmann's voluminous article, which is profusely and excellently illustrated, deals with the "so-called physiologic thrombosis of vessels at the placental site." He holds that thrombosis does not occur early in pregnancy and that what has been described as such is due to thrypsis and rarefaction of maternal tissue resulting from the action of some substance derived from fetal elements. On the other hand, he contends that the cells so frequently present in the lumina of the vessels cannot possibly be of fetal origin, and consequently must be maternal. To my mind, the important feature of his article is the insistence that such changes involve veins as well as arteries, so that the nature of a given vessel can be determined only by tracing it outward from the placental site and ascertaining its original nature.

The World War interfered with researches of this character, so that, with the exception of several articles dealing with vascular changes, no important further contribution was made until Teacher wrote *On Involution of the Uterus Postpartum* in 1927. In this article he devoted considerable attention to the regeneration of the mucosa and stated that it is completed during the third week outside of the placental site, and during the sixth week in the latter location. He held that the characteristic nodulated appearance of the placental site is due to thrombosis, which affects veins as well as arteries, and after organization the thrombi gradually disappear in situ; at least he did not mention their exfoliation. He devoted some attention to the time of disappearance of the chorionic giant cells, particularly on account of their importance in the diagnosis of chorioneplithelioma; and finally called attention to the presence of pigment bearing phagocytes. In general, the article is of importance, as it demonstrates that the author had considerable personal experience with the problems involved.

Finally, the last important contribution is the section on "the uterus in the puerperium" written by R. Schroeder in Moellendorff's *Handbuch* in 1930. He states that outside of the placental site regeneration is effected early in the third week, but in the latter location the presence of thrombosed and hyalin vessels interferes materially with the development of an epithelial covering. He is not clear about the fate of the vessels, and states that "for the first few weeks the placental site is mainly recognizable by the presence in the inner third of the muscularis of giant cells derived from chorionic epithelium. Later they disappear, and for the next few months to a year the hyalin masses and bands about the vessels constitute the characteristic feature. Within a few months they likewise disappear, when the only evidence of the gestational activity of the uterus is afforded by the final vascular sclerosis."

From this quotation it appears that Schroeder assumes that the thrombosed vessels are absorbed *in situ*, and that he had no idea that they are exfoliated as will be demonstrated later. It is interesting to note that he, like many others, states that no mitoses are observed during the first two weeks and that the cervical mucosa is practically restored by the end of the first week.

Other articles dealing with the subject were written by Fehling, Ratbeke, Broers, Jaschke, and Labhardt, but, as they give no evidence of being based upon first-hand study, it is necessary only to refer to them. Furthermore, it might be mentioned that, in addition to the articles already cited, many other writers have taken part in the discussion started by Patenko concerning the nature of the vascular changes occurring during pregnancy and the puerperium and have expressed the most divergent and contradictory views. As it would lead too far afield to consider them in detail, I shall content myself with mentioning their names: Balin 1880, Dittrich 1890, Broers 1895, Pankow 1906, Bueura 1910, Frankl and Stolper 1910, Büttner 1911, Heekner 1912, Schwarz 1923, and Werbster 1925.

From this somewhat lengthy summary several points become apparent:

I. That from the time of Friedländer most authors agree that regeneration of the uterine mucosa outside of the placental site is practically completed during the third week after delivery.

II. That during the first two weeks of the process no one has observed mitotic figures in the uterine epithelium.

III. That the cervical mucosa is essentially restored by the end of the first week.

IV. That the gross features of the placental site have been known for years, and that it practically disappears six or seven weeks postpartum.

V. That no one is conversant with the finer changes concerned in

its disappearance, and that no writer, with the exception of Ries, had any idea that the thrombosed vessels might be exfoliated instead of being resorbed in situ.

VI. That the greatest confusion still exists concerning the character and origin of the vascular changes which occur during pregnancy and the puerperium.

VII. That the probable cause of much of the uncertainty is attributable to lack of well-preserved normal material.

The purpose of the present study is to present my observations on the regeneration of the uterine mucosa during the puerperium, more particularly in relation to the changes occurring at the placental site. They are based upon the study of a large series of uteri removed by supravaginal amputation following cesarean section, as well as a certain number obtained at autopsy upon women dying from other causes than infection during the first three days of the puerperium, and upon others removed by operation during that period, but especially upon a series of eighteen uteri obtained by supravaginal amputation at various periods throughout the puerperium.

In the first group, some of the uteri were removed before and others after the extrusion of the placenta, thereby affording an opportunity for studying the conditions at the very end of pregnancy and the first minutes of the puerperium. It is scarcely necessary to add that the preservation of our specimens was ideal, as they were immediately placed in 10 per cent formalin in the operating room.

The autopsy specimens were obtained from women dying from pneumonia, heart disease, or some form of toxemia within a few hours to three days after delivery. Accordingly, they offer a material for the study of the gross appearance and microscopic structure of the early placental site, without being complicated by the presence of lesions associated with puerperal infection, as was generally the case with previous writers.

Finally, the series of uteri amputated during the puerperium offers an unsurpassed material for the study of the changes occurring between the end of the first week and the conclusion of the puerperium. This consists of eighteen uteri which were removed from uninfected women at the following stages of the puerperium:

Seventh	day, one specimen	Twenty-first	day, two specimens
Eighth	day, two specimens	Twenty-fourth	day, one specimen
Ninth	day, one specimen	Twenty-sixth	day, one specimen
Twelfth	day, one specimen	Forty-first	day, one specimen
Fourteenth	day, one specimen	Forty-eighth	day, one specimen
Sixteenth	day, one specimen	Fifty-first	day, one specimen
Seventeenth	day, one specimen	Three months,	one specimen
Twentieth	day, one specimen	Four months,	one specimen

These uteri, without the appendages, were removed for the purpose of sterilization on account of chronic nephritis, serious heart disease,

pronounced feeble-mindedness, and other psychiatric indications after the necessity for interference had been explained to the patient and her family and the necessary legal consent obtained in writing. Whether sterilization was effected in this way or by some operation upon the tubes depended upon the feelings of the patient, who was informed that one type of operation would be followed by the cessation of menstruation and the other by its continuance, and the choice was made in accordance with her expressed desire. In this connection, I noted with interest that colored women appeared to lay less stress upon the preservation of the menstrual function, while in white women the desire for its continuation appears to be in inverse proportion to their intelligence.



Fig. 1.—Decidua basalis from cesarean section uterus showing retention of greater part of the compact and all of the spongy layer. No dilatation of vessels ($\times 18$).

At this point, it may be inquired why sterilization was deferred instead of being effected in conjunction with a cesarean section at the time of labor. And my answer is that in a teaching clinic, I have thought it necessary so far as possible to limit the performance of cesarean section to patients presenting a clear-cut obstetric indication, as to do otherwise would foster unclear thinking, which I believe constitutes one of the major defects of American obstetrics.

Immediately after its removal, the uterus was placed in 10 per cent formalin, and was opened by a vertical or transverse section within the following twenty-four hours. In this way the preservation was ideal, and made possible the preparation of very satisfactory histologic specimens.

After these preliminary remarks, I shall pass on to the consideration of our findings.

Fig. 1 represents a low power section of the decidua basalis obtained from a cesarean section uterus removed immediately after the extrusion of the placenta. It

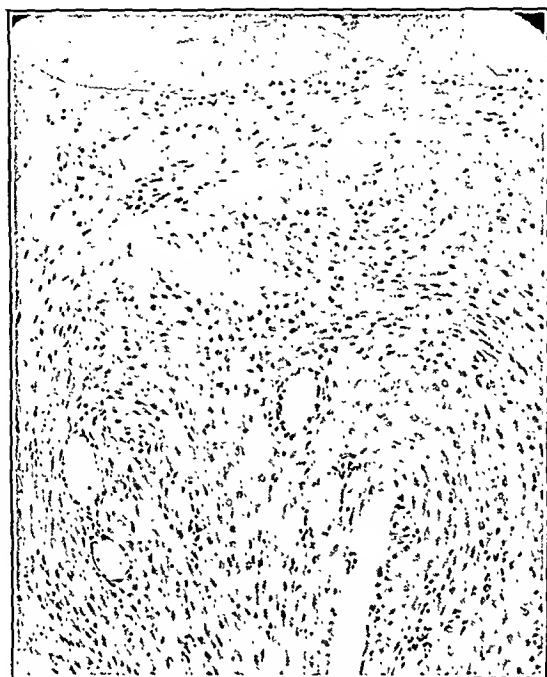


Fig. 2.—Upper part of Fig. 1, showing compact layer of decidua, and only small vessels ($\times 75$).



Fig. 3.—Lower part of Fig. 1, showing well preserved glands of spongy layer ($\times 75$).

will be noted that it is relatively thick, and that separation had occurred in the upper part of the compact layer, and that large numbers of compressed glands are present in the spongy layer. Furthermore, it will be noted that no distended or

thrombosed vessels are present. Figs. 2 and 3 show the same area more highly magnified and accentuate the points made. It will be noted that there is no free hemorrhage and that the vessels in Fig. 2 are small in caliber. Attention is directed to the profusion of gland spaces in the depths of the decidua and to their relation to the underlying muscle, which effectively disproves the statements of many early writers that no glands are present in the decidua basalis.

In 1917, as the result of the study of 50 uteri removed at cesarean section, I contended that the statements in the literature concerning the line of separation of the placenta and membranes were too arbitrary and schematic, and that, while separation generally occurs in the spongy layer, the line is very irregular, so that in places a thick layer of decidua is retained, in others only a few layers of cells re-



Fig. 4.—Thin portion of decidua basalis from same uterus as Fig. 1, showing chorionic giant cells ($\times 75$).

main, while in still others the muscularis is practically bare. Further experience has served to confirm such observations, and Fig. 4, which represents a section from the same placental site as shown in Fig. 1, indicates the correctness of my statements. Here are also seen the chorionic giant cells which constitute a characteristic feature of the decidua basalis and the musculature immediately beneath it.

In my experience the conditions just described constitute the usual picture of the decidua basalis at the time of labor, but in occasional instances changes in the vessels are noted, such as were described by Friedländer and Leopold, and confirmed by numerous subsequent observers. These consist in the replacement of the walls of certain arteries and veins by a thick zone of hyalin material, through which

are scattered large faintly staining cells, with the eventual replacement of the endothelium by similar cells, which may completely or partially fill the lumen. In some cases such vessels contain fluid blood, while in others it has undergone thrombosis. Reference has already been made to the prolonged discussion concerning the nature of such cells, and I am inclined to believe that they are fetal in origin, although the question cannot be regarded as finally settled.

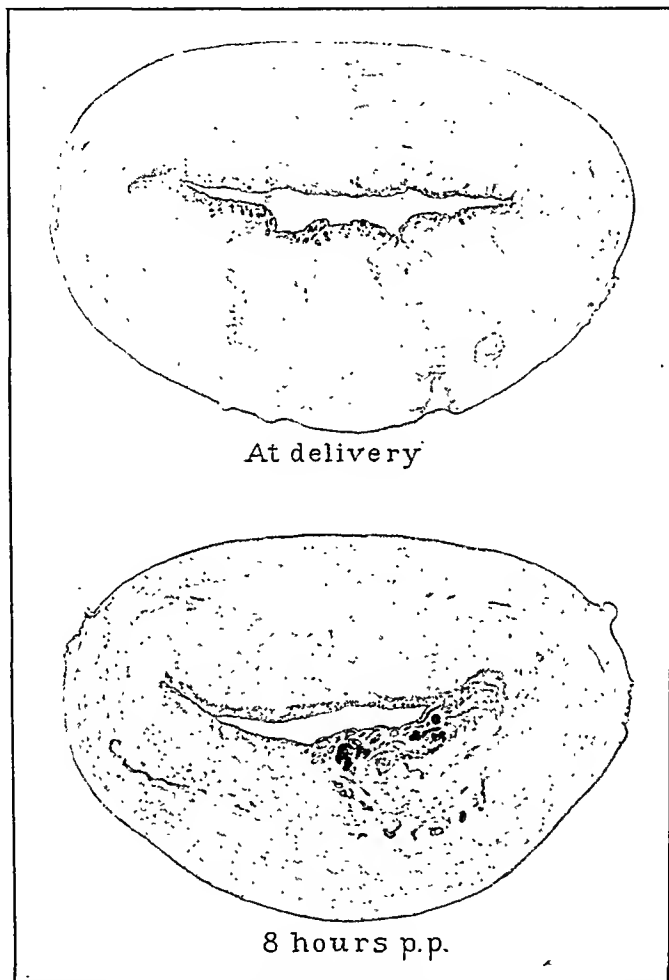


Fig. 5.—Sketch showing above cesarean section uterus without placental site, and uterus eight hours postpartum with well developed placental site ($\times \frac{1}{2}$).

The fact that I have observed such degenerated vessels in only a fraction of the fresh placental sites which I have studied indicates that they are not essential to the further development of that location. Furthermore, the fact that their occurrence is not limited to the last weeks of pregnancy, but may sometimes be noted in the early months—when they attain unusual development—indicates that they are not necessarily connected with the terminal processes of pregnancy. Indeed, I must confess that I do not understand their significance, but I

am inclined to believe that their presence at the end of pregnancy may be regarded as more or less accidental.

Finally, in connection with the placental site immediately after the extrusion of the placenta, I may say that it is sometimes impossible to recognize its location in the hardened uterus. Frequently it is indicated by the presence of an unusual number of compressed blood vessels in a limited area of the muscularis, in other uteri it can be identified only after histologic examination, when the presence of chorionic giant cells in the basalis and the muscularis underlying it affords incontrovertible proof of its location. Fig. 5 gives a good idea of the gross appearance usually observed.

Within a few hours after the completion of labor, striking and characteristic changes occur at the placental site, and convert it from the

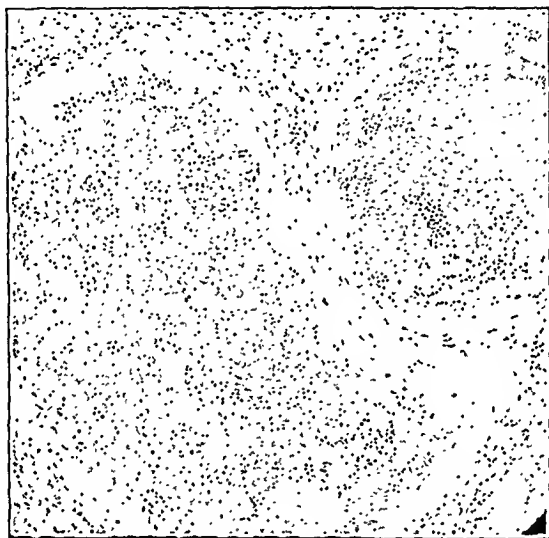


Fig. 6.—Placental site forty-five minutes postpartum, showing thrombosed veins with hyalin walls ($\times 75$).

state just described into the structure with which all pathologists and some obstetricians are familiar. When the uterus is opened the first day after labor the placental site appears as a rounded, blood stained, ragged and nodular structure, 8 to 10 cm. in diameter, and projecting 4 to 10 mm. above the general surface. On section, it is hemorrhagic in appearance and contrasts sharply with the underlying pale muscularis, while closer examination shows that it consists of large numbers of closely packed blood vessels filled with fluid and coagulated blood. This is clearly shown in Fig. 5, which represents a cross-section through the uterus of a patient dying from lobar pneumonia eight hours after delivery, and contrasts sharply with the upper figure in the same illustration, a uterus amputated after cesarean section.

This difference clearly is of great interest and the question arises as to how it is brought about. My investigations show that it begins to

develop almost immediately after delivery, as is proved by the findings in Fig. 6, from a uterus removed on account of rupture, three-quarters of an hour after delivery. This figure shows that the decidua basalis



Fig. 7.—Portion of placental site twenty-four hours postpartum ($\times 18$).



Fig. 8.—Lower part of placental site shown in Fig. 7, showing retention of endometrial tissue ($\times 75$).

is occupied by large dilated blood vessels and bears little likeness to the conditions existing immediately after delivery, as were shown in Fig. 1, and represents two large vessels with partially hyalin walls, and filled with blood in process of coagulation.

Similar, but more pronounced, conditions are present in the twenty-four-hour placental site. Examination under low power (Fig. 7) shows that the superficial portion of the basalis is almost entirely occupied by distended vessels, both arterial and venous, which are rapidly undergoing thrombosis. A more highly magnified portion of the same section (Fig. 8), shows the junction between the basalis and muscularis, and demonstrates that the deepest part of the former still retains its original structure, with definite glands and a non-decidual stroma.

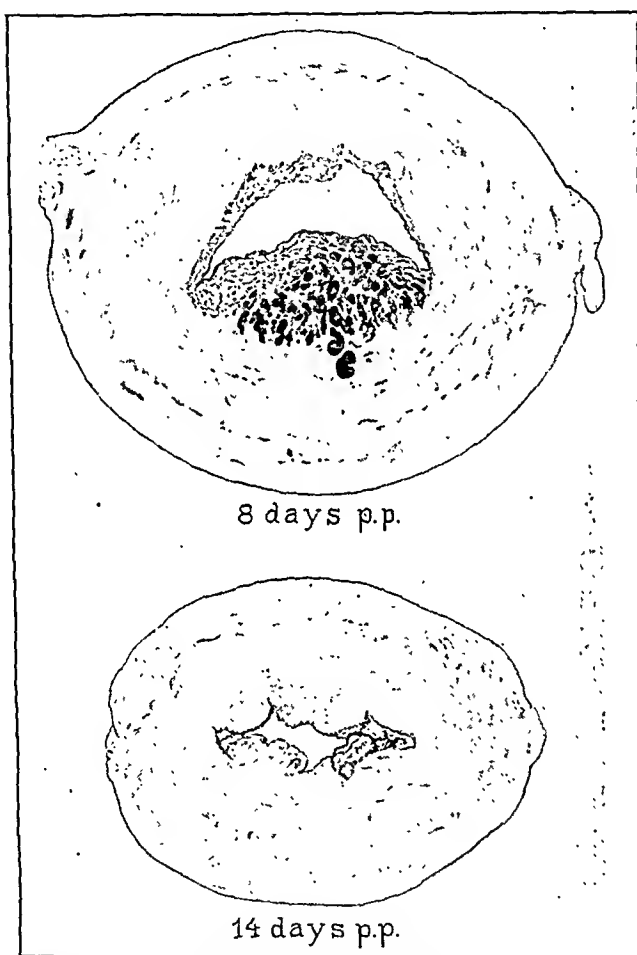


Fig. 9.—Sketch showing placental site on eighth and fourteenth days postpartum ($\times \frac{1}{2}$).

When it is attempted to explain the genesis of this sudden change, one is compelled to theorize, but it seems probable that it is the result of variation in the intensity of the uterine contractions. It would appear that the absence of vascular engorgement immediately after delivery is due to the fact that the uterus at that time is contracted to the maximum, so that both arteries and veins are compressed to the greatest extent, thus rendering the entire organ "blood-tight." Whereas later, the contractions are less vigorous, with the result that

the thick walled arteries in the muscularis are not sufficiently compressed to interfere with circulation, while the lumina of the thin walled veins are practically obliterated, and as a consequence blood collects in the collapsed sinuses at the placental site, and later undergoes coagulation and thrombosis.

From this stage onward, the arteries undergo obliteration, while the thrombosed veins become partially or completely organized, and

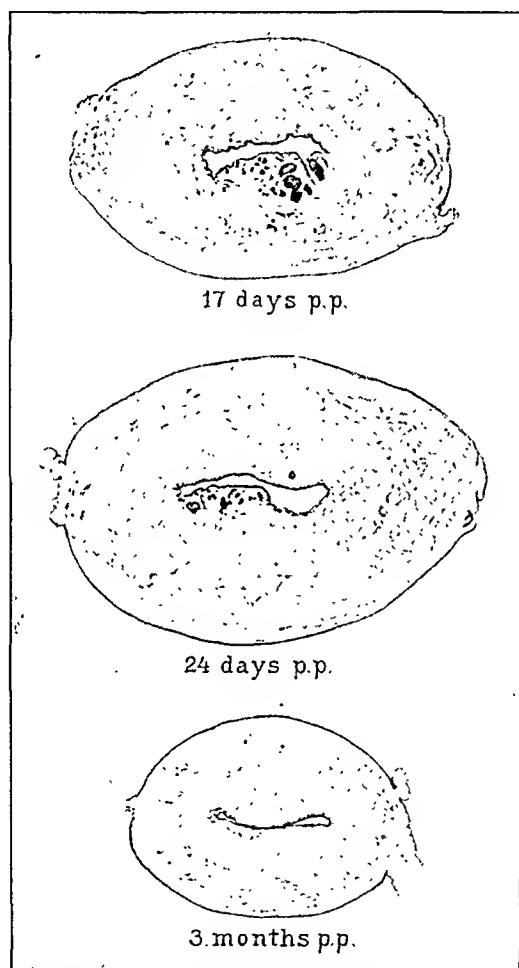


Fig. 10.—Sketch showing placental site at seventeenth, twenty-fourth, and one hundred twentieth days postpartum ($\times \frac{1}{2}$).

projecting from the surface give the placental site its characteristic nodular structure. At the same time the placental site becomes progressively smaller, and under normal conditions disappears during the course of the seventh week. This progressive decrease in size is graphically shown in Figs. 9 and 10, which represent diagrams drawn to scale at various periods of the puerperium.

As was indicated in the historical summary, clear statements are not available as to how this is accomplished, and it is the object of this

paper to fill that gap. It was also pointed out that many writers attributed the lack of knowledge to the fact that suitable material from normal puerperal women had not been available for study, and it is hoped that the findings in the 18 specimens at our disposal will do away with that criticism.

Before taking up in detail the changes which occur at the placental site, a few words are necessary concerning the regeneration of the mucosa outside of it. As was indicated in the historical summary, most writers agree that this is usually completed during the third week and I agree with them. The rapidity with which the process is completed should not appear surprising when one recalls that even more rapid repair follows each menstrual period, as well as after an ordinary curettage, as has been known since the time of Werth.

Fig. 11 represents the extent of regeneration occurring within five days after curettage. In this instance, the suspicion of chorionepi-



Fig. 11.—Regeneration of endometrium five days after curettage for suspected chorion-epithelioma ($\times 75$).

thelioma led to a diagnostic curettage, and an erroneous diagnosis during my absence was followed by the removal of the uterus five days later. Some analogous conditions were found two days after curettage for a supposed incomplete abortion. In this instance, the existence of a tubal pregnancy had been overlooked and the uterus curetted elsewhere. Ten days later, the patient came to Baltimore, had an intraperitoneal hemorrhage while shopping, and died without operation just after admission to the hospital. Autopsy showed a freshly ruptured tubal pregnancy, and histologic examination revealed a normal endometrium without any trace of the recent decidual transformation.

Our specimens show that the endometrium is usually completely regenerated during the third week following labor, and the process appears to be effected somewhat as follows: during the first few days, the blood-stained decida vera varies from 1 to 3 mm. in thickness, is softer than usual, and yields to the slightest touch. I possess no speci-

mens showing the histologic conditions from the third to the seventh day, but at the latter time it is found that the superficial layer is infiltrated with blood, the individual decidual cells have lost their staining properties, and have become necrotic and sometimes hyalin, while the superficial layer is more or less infiltrated by leucocytes. Beneath



Fig. 12.—Decidua vera nine days postpartum, upper portion necrotic and lower portion with well preserved glands and stroma ($\times 75$).

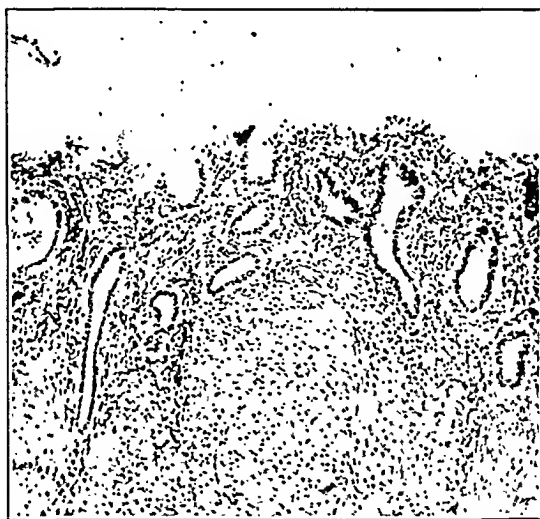


Fig. 13.—Partially regenerated mucosa outside of placental site, eight days postpartum ($\times 75$).

this layer are numerous glands, which are separated from one another by a stroma, whose cells show no sign of decidual transformation. Such a condition is well shown by Fig. 12, obtained on the ninth day of the puerperium. At that time, many of the epithelial cells lining the glands are irregular in shape and size, and the nuclei have lost

their usual structure, and appear enlarged, pale and swollen. I was unable to find mitotic figures during the first two weeks. In a short time the necrotic tissue is cast off in shreds and is carried away by the lochia, and epithelium derived from the fundi of the glands grows over the denuded areas. This is well shown in Fig. 13 from an eight-day puerperal uterus.

Within a few days the entire free surface becomes covered by epithelium, when the new mucosa may be said to be restored. At first it does not always present the characteristic structure, as is shown by Figs. 14 and 15 from a twelfth-day uterus. These two pictures were obtained from adjacent portions of the same slide, and while one consists of a very thin stroma covered by a single layer of cuboidal epithelium, but without glands, the other shows fairly normal con-



Fig. 14.

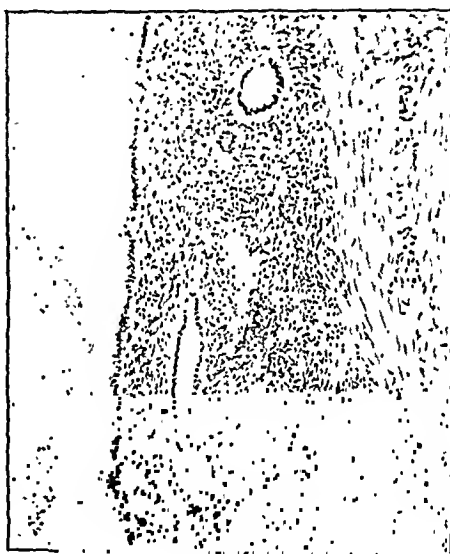


Fig. 15.

Fig. 14.—Endometrium twelve days postpartum, showing regenerated epithelium but no glands ($\times 75$).

Fig. 15.—Endometrium twelve days postpartum, showing almost complete regeneration ($\times 75$).

ditions. Completely normal conditions are gradually restored, and Fig. 16, which represents the endometrium directly opposite the placental site of a twenty-one-day uterus, shows an essentially normal endometrium except for the presence of certain small areas of degeneration.

In other words, my observations lead me to conclude that from about the fourteenth day onward, the uterine cavity outside of the placental site is completely lined by epithelium, although several more days elapse before the endometrium can be regarded as fully restored.

My observations tend to indicate that neither the existence of moderate infection nor the retention of fetal tissue following abortion in full-term labor seriously interferes with regeneration outside of the

placental site; although it may definitely delay the involution of the latter. That this belief is correct is shown by the findings in a uterus removed on the seventeenth day from a patient who presented signs of intrapartum infection, but whose puerperium was afebrile. In this

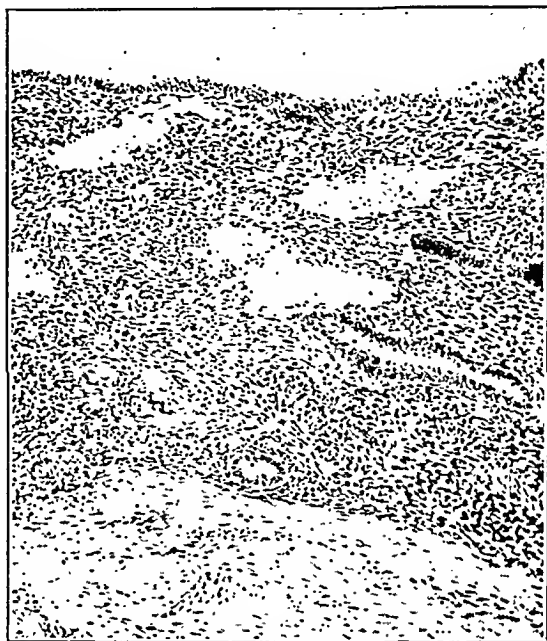


Fig. 16.—Endometrium twenty-one days postpartum, showing complete regeneration ($\times 75$).

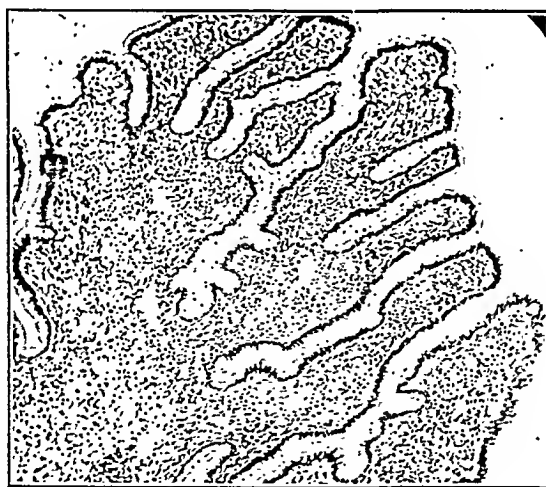


Fig. 17.—Cervical mucosa completely regenerated two weeks postpartum ($\times 50$).

instance the mucosa had been completely restored, but it was markedly infiltrated with round cells and eosinophiles, instead of presenting a stroma made up of the usual oval or fusiform cells.

In the historical section, it was stated that various authors had claimed that the cervical mucosa was not cast off during the puer-

perium, and was promptly restored to its original condition. This has likewise been my experience, and is what one would expect from Stieve's study of the behavior of the cervical mucosa during pregnancy and at the time of labor. In general it may be said that the

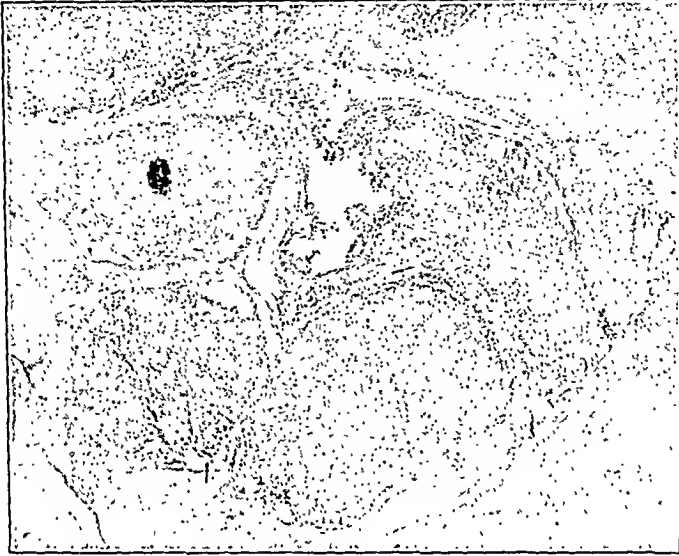


Fig. 18.—Placental site thirty hours postpartum ($\times 18$).



Fig. 19.—Placental site eight days postpartum, showing thrombosed vessels ($\times 75$).

cervical mucosa is not cast off, and becomes completely restored by the end of the first week, although the tissue beneath it may long remain infiltrated with blood. Fig. 17, representing a section through the cervical mucosa at the end of the second week, will serve to confirm this statement.

I shall now consider in more detail the structure of the placental site and the means by which it is obliterated.

Fig. 18, which represents a low power picture of the placental site thirty hours postpartum shows that it is in great part made up of dis-



Fig. 20.—Placental site twelfth day, showing partially organized thrombosed vein with well developed endometrium beneath it ($\times 75$).

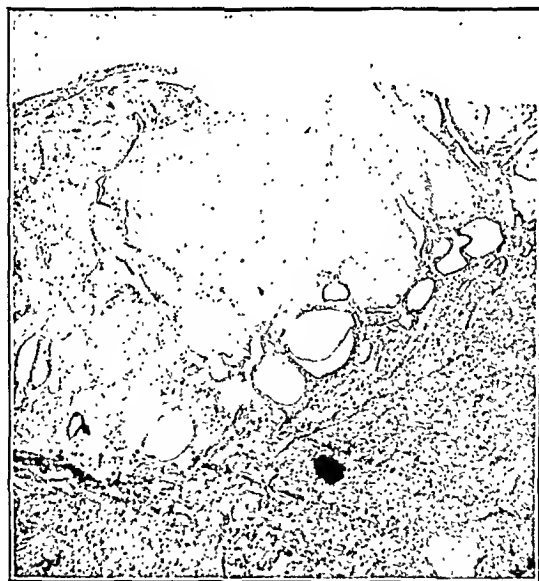


Fig. 21.—Part of placental site seventeenth day, showing undermining by endometrium ($\times 18$).

tended vessels, which are separated from one another by only a small amount of tissue. Some of the vessels represent arteries which have undergone obliteration and hyalin degeneration, but most of them are veins, whose contents have undergone coagulation, and which are beginning to become organized by the invasion of fibroblasts. At this

time there is a good deal of free blood in the superficial layers, associated with a moderate amount of leucocytic infiltration, which, however, is not pronounced unless it is associated with infection. As the puerperium advances a portion of the superficial tissue undergoes necrosis and is cast off with the lochia, but the greater part of the placental site is retained and is gradually cast off or exfoliated as will be explained later.

On the eighth day, the conditions remain essentially the same, except that the placental site has become definitely smaller, but at the same time somewhat thicker than during the first few days. Even at this time, however, not all of the thrombosed vessels have become or-



Fig. 22.—Part of placental site seventeenth day postpartum, with undermining at left margin ($\times 18$).

ganized, as is shown by Fig. 19. At this time, the placental site is not yet covered by epithelium, which appears to be limited to its margins and to its basal portion. In these locations, however, it is seen that well-developed endometrial tissue is present and apparently is extending beneath the thrombosed vessels which now make up the greater part of the placental site. This is still more clearly shown by Fig. 20, which represents sections from the twelfth day.

A few days later, the placental site is constituted by a dense mass of tissue consisting of obliterated arteries and thrombosed and organized veins, while a good deal of the tissue between them has undergone hyalin degeneration. Figs. 21 and 22 show the conditions in two specimens at the seventeenth day. In the first, the placental site ex-

tends deeply down into the muscle wall, while in the other it projects into the uterine cavity and presents margins which are being undermined by endometrium extending from the free portion of the uterus.

In Fig. 21, it is seen that endometrium tissue lies between the placental site and the muscularis and that its glandular spaces are dilated into irregularly shaped cavities. By this time a certain amount of mucosa has advanced over the free surface of the placental site, partially covering it and sending processes down into the interior.

Fig. 23 gives a good idea of one margin of the placental site under higher magnification and shows obliterated vessels separated by endometrial stroma, while at the lower left-hand corner typical endometrial glands and stroma are seen. The hyalin structure at the base of the section is clearly an obliterated artery, which presumably repre-

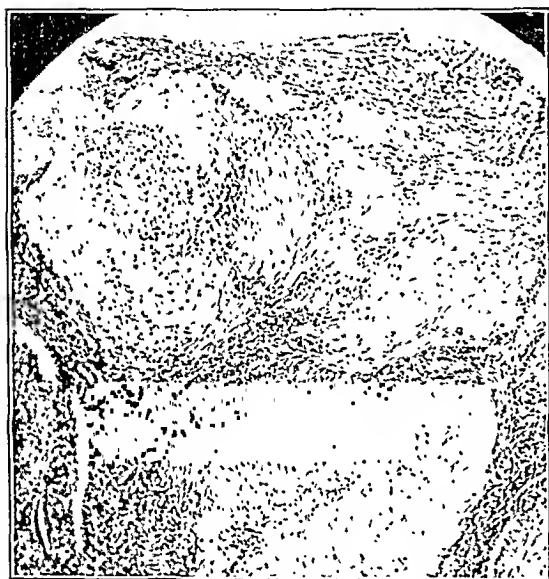


Fig. 23.

Fig. 23.—Placental site seventeenth day, showing thrombosed vessels and undermining by endometrium ($\times 75$).



Fig. 24.

Fig. 24.—More highly magnified portion of Fig. 22, showing regenerated endometrium on free surface with thrombosed vessels beneath ($\times 75$).

sents the peripheral end of a similarly obliterated vessel lying in the muscularis beneath the placental site.

Higher power preparations from the other seventeen-day uterus give still further information concerning the endometrial growth. Fig. 24 shows that the free surface of the placental site is covered by a thin layer of well regenerated mucosa, while beneath it are a number of organized vessels. On the other hand, Fig. 25 shows that endometrial tissue has developed between the placental site above and the muscularis below; in other words, it is showing signs of undermining the latter.

A few days later, the placental site has become definitely smaller, and Fig. 26 gives a wonderful picture of the conditions prevailing at

the twentieth day. Here the placental site is seen as a broad rounded projection into the uterine cavity, and comes almost in contact with the regenerated mucosa on the opposite wall of the uterus, and is clearly seen to be made up of organized vessels. On the right-hand



Fig. 25.—Another area from Fig. 22, showing endometrial tissue beneath placental site ($\times 75$).

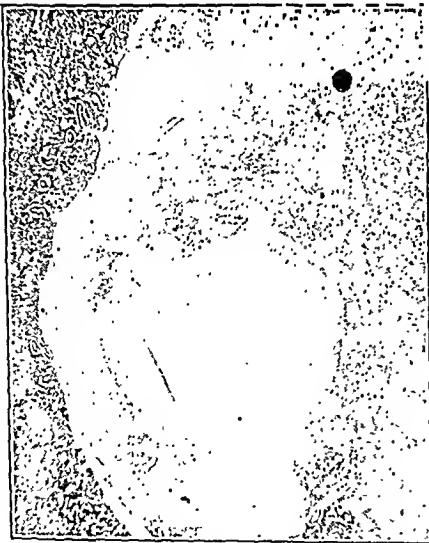


Fig. 26.



Fig. 27.

Fig. 26.—Twentieth day placental site completely filling uterine cavity and coming in contact with regenerated mucosa of opposite wall ($\times 18$).

Fig. 27.—Area from Fig. 26, showing endometrium beneath placental site ($\times 75$).

side the lumina of numerous glands are present, while in the lower left-hand corner it is apparent that the margin of the placental site is being undermined by endometrial ingrowth.

These conditions are rendered even clearer by the study of several more highly magnified sections. Thus, Fig. 27 from the margin of the same placental site shows the presence of well developed endometrial tissue between it and the underlying muscularis, and Fig. 28 shows the invasion of the characteristic placental site tissue by narrow strands



Fig. 28.—Another area from Fig. 26, showing invasion of hyalin tissue by endometrial processes ($\times 75$).



Fig. 29.—Twenty-fourth day placental site with endometrial undermining on right side ($\times 18$).

of endometrium. Similar conditions were noted in a specimen from the twenty-first day, but space does not permit their presentation.

As the puerperium advances the placental site is constantly growing smaller, and Fig. 29 represents under low power the conditions at the base of the placental site on the twenty-fourth day. Here again one

sees the placental site with its characteristically obliterated vessels, and at its base, and particularly in the right lower corner, the underlying endometrium. Fig. 30 gives a more highly magnified picture of the latter area; and shows well developed endometrium beneath an organized thrombosed vessel.



Fig. 30.

Fig. 30.—A portion of Fig. 29 ($\times 75$).



Fig. 31.

Fig. 31.—Hyalin vessel lying free in uterine cavity eight days postpartum ($\times 50$).



Fig. 32.—Fragment of placental site with endometrial inclusions free in uterine cavity ($\times 50$).

From this time onwards, the placental site rapidly becomes smaller and smaller, to disappear eventually at about the end of the seventh week, and the question arises as to how the decrease in size and eventual disappearance is brought about. It seems to me that the evidence thus far adduced makes three points clear: first, that the process is in no way connected with inflammatory change; second, that

there is no indication of any extensive necrotic process; and third, that all of the specimens show unusual proliferation of endometrial tissue, which does not merely cover the surface of the placental site, but invades it in all directions, but particularly extends between it and the underlying muscularis, so that in a general way it undermines the placental site and ultimately leads to its extrusion or exfoliation.



Fig. 33.

Fig. 33.—Fragment of endometrial tissue lying free in uterine cavity twenty-six days postpartum ($\times 50$).

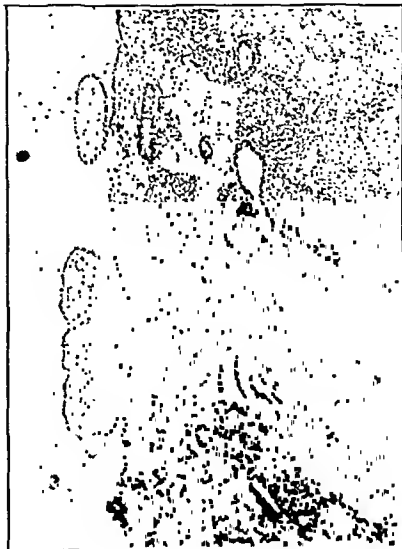


Fig. 34.

Fig. 34.—Exfoliation of polypoid masses of tissue, twenty-first day postpartum ($\times 75$).



Fig. 35.—Pedunculated mass of placental site tissue in process of extrusion, twenty-fourth day postpartum ($\times 75$).

I think it fair to state that the preparations thus far considered make such a supposition appear plausible, but that the evidence is not conclusive. Consequently, additional evidence must be adduced if one expects to prove that the placental site is exfoliated as the result of undermining by endometrial tissue.

To my mind, this is easily done, as even casual examination of the sections conclusively shows that tissue of various kinds can be found free in the uterine cavity throughout the puerperium, and that these may consist of shreds of necrotic mucosa; of particles of tissue which can readily be identified as obliterated and hyalin vessels; of particles of hyalin tissue containing fragments of endometrium; of fragments of completely regenerated endometrium; and finally of polypoid masses of tissue which can be demonstrated upon the surface of the placental site in actual process of extrusion. Furthermore, this casting off of tissue is not limited to the two weeks during which the lochia persist, but it continues up to the very moment the placental site disappears.

For example, Fig. 31 shows an obliterated vessel found free in the uterine cavity on the eighth day. Furthermore, Fig. 32 shows tissue



Fig. 36.

Fig. 36.—Remnant of placental site, forty-eighth day postpartum ($\times 18$).



Fig. 37.

Fig. 37.—Part of Fig. 36 ($\times 75$).

found free in the uterine cavity on the twenty-first day; while Fig. 33 shows a fragment of endometrial tissue found on the twenty-sixth day.

Still more conclusive evidence is afforded by Figs. 34 and 35 in which polypoid masses made up of hyalin and partially organized placental site tissue are attached to the surface of the endometrium by such narrow peduncles that but little imagination is required to visualize their separation.

Finally, the crowning evidence is presented by a uterus forty-eight days after delivery, in which the placental site is represented by a tag of tissue, 1×3.5 mm., projecting into the uterine cavity, but still attached by its base to the superficial portion of the endometrium. This is strikingly illustrated by Figs. 36 and 37, the latter representing a high power picture of the former, and which clearly shows that the stroma of the polypoid mass presents the histologic structure which

we have learned to consider characteristic of the placental site. To my mind, these pictures are so convincing that more detailed description seems unnecessary. Furthermore, in order to show that the process of regeneration has been completed, I would direct attention to the tortuous and corkscrew-like character of the glands in the regenerated endometrium of this specimen. It is clear that they belong to an advanced period of premenstrual swelling, and that this is the case is proved by the fact that the patient began to bleed on the morning of operation, as well as by the additional fact that other portions of the same endometrium showed the characteristic changes associated with actual menstruation.

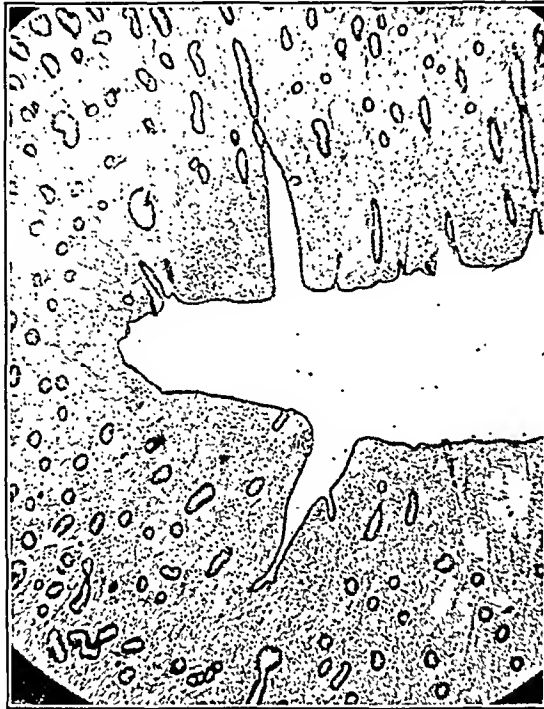


Fig. 38.—Completely regenerated mucosa fifty-first day postpartum. All trace of placental site has disappeared ($\times 50$).

Finally, I would direct attention to Fig. 38, which represents a section through a fifty-one-day uterus, and shows the return to absolutely normal conditions.

In the foregoing pages, I have attempted as briefly as is consistent with clarity to outline the fate of the placental site in the normal puerperal woman, and I feel that it has been made clear that six to seven weeks are required for its disappearance, and that it is not effected by absorption in situ, but rather by a process of exfoliation which is in great part brought about by the undermining of the placental site by the growth of endometrial tissue. This is effected in part by extension and downgrowth of endometrium from the margins of the placental site, and partly by the development of endometrial tissue from the glands and stroma left in the depths of the decidua basalis after separation of the placenta.

In general, I am inclined to attach more importance to the former than to the latter mechanism, for the reason that in many instances, the base of the placental site extends beyond the limits of the original basalis so that obliterated arteries and thrombosed veins may lie in the inner layer of the muscularis, and consequently must be extruded before an entirely normal endometrium can be degenerated. In this event, the endometrial tissue derived from fragments of the basalis would lie internal to such vessels, so that it would seem that the only method by which endometrium could come to lie external to them would be by some such process of invasion and undermining, as I have described.

Regarded from another point of view, such a process of exfoliation should be regarded as very conservative, and as a wise provision on the part of Nature; otherwise great difficulty might be experienced in getting rid of the obliterated arteries and organized thrombi, which if they remained in situ would soon convert a considerable part of the mucosa into a mass of scar tissue, with the result that after a few pregnancies it would no longer be possible for it to go through its usual cycle of changes, and the reproductive career would come to an untimely end. Moreover, in a certain way, this mechanism of exfoliation is suggestive of the life history of the corpus luteum, which, leaving out of consideration its internal secretory function, appears to have as one of its objects the prevention of the undue formation of scar tissue in the ovary.

Before bringing this somewhat lengthy paper to a close, I wish to refer to several points of interest in connection with the process. In the first place, if exfoliation is effected as I have indicated, the question arises as to why it is not entirely limited to the undermining and extrusion of the placental site, instead of the endometrial tissue covering, in part at least, the free surface of the placental site or invading its depths, as our specimens show, with the result that large amounts of newly formed endometrial tissue are cast off during the exfoliative process. For this I can give no satisfactory explanation, and I can only suggest that in this, as in many other separative processes Nature appears to be unduly lavish.

Again, I would direct especial attention to the fact that throughout the entire process fragments of tissue are being cast off. For many years, we have associated loss of tissue with the lochial flow, but I imagine that few of us had any idea that the process continues for a month or more after its cessation—in other words, that it lasts throughout the entire anatomic puerperium.

Furthermore, in examining my specimens, I was rather impressed with the relative absence of phagocytes containing blood pigment. It is a well-known physiologic fact that they are unusually abundant in tissue which is caring for past hemorrhage, but in general they were less frequent in the placental site than one would expect. In several

specimens they were present in large numbers, while in others they appeared to be scanty or even entirely lacking.

In discussing the fresh placental site, I referred to the presence of characteristic chorionic giant cells in the decidua basalis and in the muscularis underlying it, and I stated that in many cesarean section uteri their recognition afforded the only means of identifying that area. Likewise, in the historical section, I mentioned the views of various writers concerning them. In this place, I merely wish to state that in my experience they usually disappear by the eighth or tenth day, and that their persistence later is exceptional. Indeed, whenever that occurs, I am inclined to believe that chorionic villi have been retained in utero. At least, that was the case in two specimens examined after abortion, but my experience in that regard is too slight to be of value at the moment, and it must remain a subject for future investigation.

Likewise, I have repeatedly referred to the presence of obliterated arteries at the placental site, with unusual proliferation of the intima and pronounced hyalin changes in the rest of their walls, and in the historical section I referred to the discussion as to their nature, which has already lasted over a half century without being definitely settled. In this place I hesitate to mention the subject, and only do so for the purpose of stating that I regard the obliterated arteries at the placental site as the peripheral terminations of vessels presenting similar changes in the muscle wall of the uterus. These lateral ends are cast off with the placental site, while the distal portions remain in situ and present the characteristic picture which some designate as sclerosis, and with which we are all familiar. Certain of these vessels are doubtless replaced by smaller ones as described by Goodall, others become entirely obliterated and are probably completely absorbed, while in many women large numbers persist for the rest of life, and afford a means for diagnosing the existence of previous pregnancy. In my opinion, the complete disappearance of the distal ends at the placental site, and the persistence of the rest of the vessel elsewhere, would seem to constitute an additional argument in support of my view of exfoliation.

Finally, I would refer once more to the quotation from Ries, in the historical section, and desire to redirect attention to the fact that he is the only writer with whom I am familiar, who has described anything like the process of exfoliation here set forth. At the same time, his description is too meager and his specimens too faulty, to justify any positive opinion. If, however, he and I noted the same process it would appear strange that it has been overlooked during the forty odd years which have elapsed between the two papers.

NOTE: The bibliography of this article was not completed owing to the death of Dr. Williams.

(For discussion, see page 793.)

THE PATHOLOGY OF SOME SPECIAL OVARIAN TUMORS AND THEIR RELATION TO SEX CHARACTERISTICS*

By PROFESSOR DR. ROBERT MEYER, BERLIN, GERMANY

IT MAY appear unusual to state that tumors may possess function. Admittedly however every body cell functions even if abnormal; and cells of a newgrowth may exhibit a specific functional capacity exactly corresponding to the function of the tissue from which they arise. We know that the ovary plays a special rôle in the determination of sex characteristics both in the body as a whole and in the genital organs, therefore, it cannot be surprising to find that in some ova-



Fig. 1.—Testicular seminoma, cells secondarily invading testicular tubules.

rian neoplasms the tumor cells functionate and participate in this process of development of secondary sex characters.

I. DISGERMINOMA OVARI (SO CALLED "SEMINOMA")

I have given the name "Disgerminoma" to the first type of tumor to be discussed here. French writers call it "Seminoma ovarii" because of its histologic similarity to the so-called seminoma of the testis, which represents about 60 per cent of all testicular neoplasms. It is carcinomatoid in character since it consists of large epithelial cells. The term seminoma was chosen because this testicular newgrowth in parts of its structure resembles seminal tubules. As a matter of fact these tubular formations are not produced by the growth;

*Read by invitation at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18 to 20, 1931.

they only represent seminal tubules secondarily invaded by the neoplasm, as seen in Fig. 1. The structure of the testicular tumor is alveolar for the greater part and only in this respect does it resemble an ovarian tumor. Of course, the latter contains no tubules, but otherwise these neoplasms of testis and ovary are very similar histologically, differing only in the relative quantity of connective tissue and the cord-like arrangement of epithelial masses (Figs. 2 and 3). These tumors are furthermore characterized by a lymphatic infiltration of the connective tissue and by loosely joined epithelial cells which are rich in protoplasm.

A long time ago I had observed that these neoplasms are seen very often in pseudohermaphroditic individuals. I have collected 27 cases

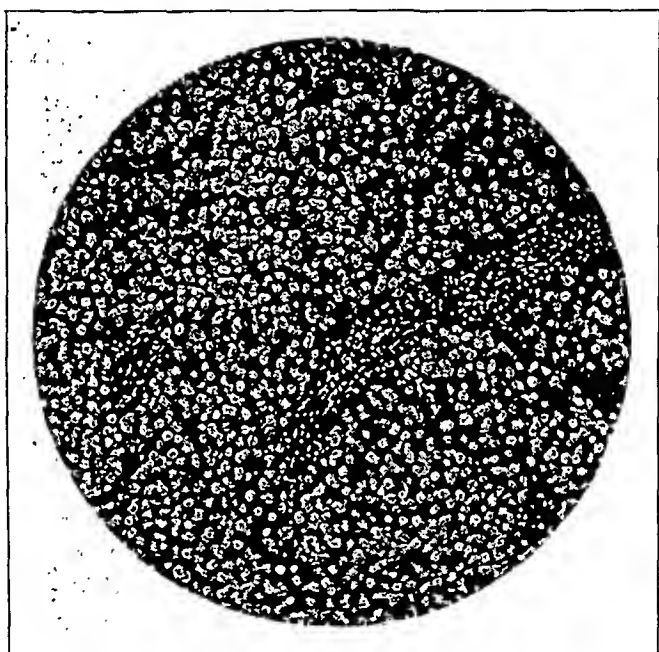


Fig. 2.—*Disgerminoma testiculi*.

of this type: 4 had a definite testicle on one side, 8 had a doubtful testicle on the other side; of 6 other cases, 5 probably had an ovary and 1 a definite ovary on one side. In 5 instances the tumors were bilateral and the patients showed predominantly female characteristics but it was impossible to determine definitely the nature of their sex glands. In 2 cases the other sex gland was aplastic or rudimentary. In 2 individuals there was an ovariotestis on the other side. In a number of these patients certain physical and mental characteristics did not accord with the type of sex gland they possessed.

But I have also collected 21 cases in women with typically female body, without hermaphroditism. Of these, 5 had bilateral tumors; in 2 instances the condition of the opposite ovary was unknown, while

in 11 it was normal, and in 3 cases the other ovary was completely absent.

In the presence of these tumors we find, in women, external genitalia and uterus infantile in character, and, in men, cryptorchism with poorly developed testicles.

One of the striking features of this type of ovarian newgrowths is the early age at which they appear, usually in the second or third decade: 11 patients were between nine and eighteen years old, 5 between twenty and twenty-eight years, and 3 patients between thirty-three and forty-nine years old.

This variety of neoplasm in the testes of normal men or male hermaphrodites occurs at a much later age.

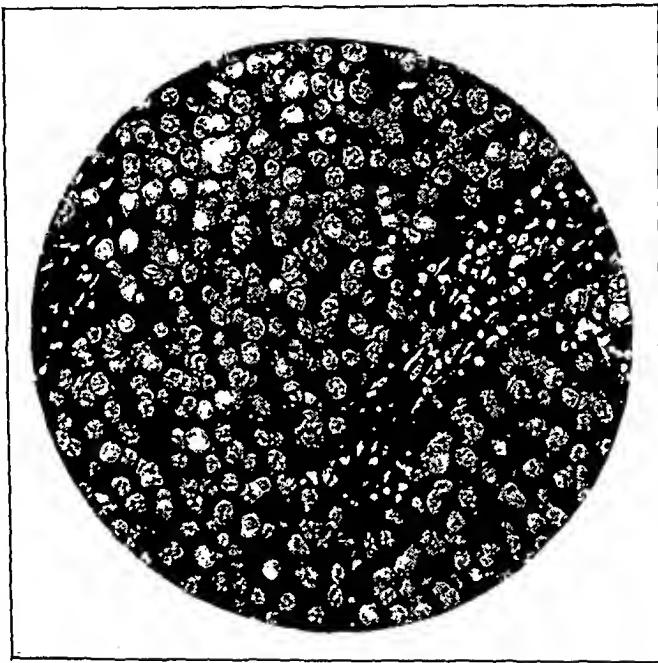


Fig. 3.—Disgerminoma ovarii. Similarity to Fig. 2 is evident.

Such tumors in the sex glands of either sex show in general the same form of histologic structure, excepting the secondary invasion of the seminal tubules in the male. They occur especially in poorly developed sex glands of normal persons, in pseudohermaphrodites, and in ovariotestis. We, therefore, must conclude that they arise from cells which existed in the embryo before the stage of sex differentiation. It is my belief that they arise from an undifferentiated form of germinal cells which had lost their faculty of becoming either masculine or feminine in type. In other words, these early germinal cells have lost their specific power of sex direction and therefore can develop into identical pathologic structures in both types of sex glands.

As these tumors originate from undifferentiated sex cells they necessarily will be void of any specific hormonal influence and thus fail to exert a specific stimulation for development of the secondary sex characters. They neither masculinize nor feminize the individual.

Disgerminomas may attain an enormous size and thereby destroy the ovary and even uterus, but if operated upon the prognosis is good. Many cases remain permanently cured without recurrence.

II. GRANULOSA CELL TUMORS

In this class of ovarian tumor the structure assumes a variety of forms. It may occur: (1) as a folliculoma, often associated with cysts (Fig. 8); (2) as solid masses (Fig. 9), or in thin cords (Fig. 10), or

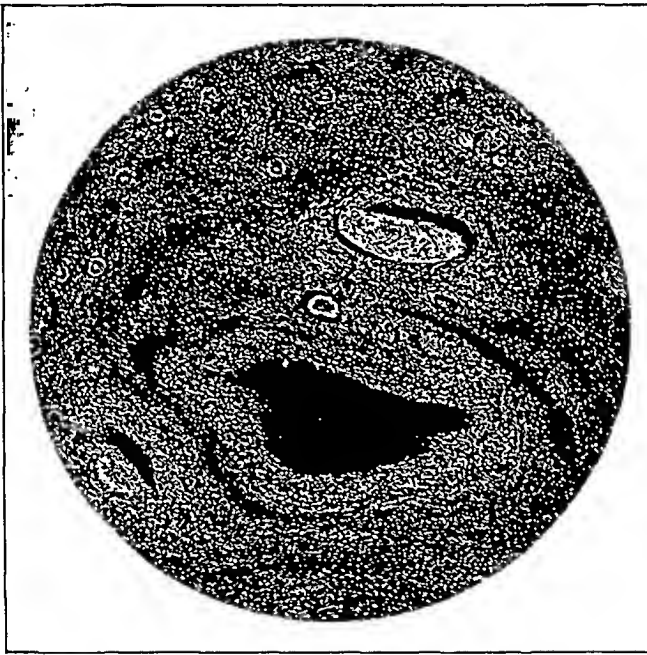


Fig. 4.—Solid masses of granulosa cells in medullary portion of ovary of newborn infant.

sometimes as tubules but most common are the solid, carcinoma-like masses often containing areas of hyaline degeneration of the stroma (Fig. 11); and (3) finally as a diffuse structure resembling a sarcoma (Fig. 12).

All these various forms may be found represented in one and the same growth though one may predominate, or even each may occur independent of the other. Thus they can merge from one form into another and we must conclude that they all arise from only *one* type of cell.

The morphologic resemblance to the normal granulosa cell is most striking in the folliculoid form. One may discover even a sort of theca cell around cysts and cell masses. In most instances the charac-

teristics of granulosa cells can be recognized only through transitional forms.

In my opinion these tumors arise from undifferentiated cells and not from epithelial cells of the true follicle.

It has never been demonstrated that such a growth could originate from the follicle, and it is more than unlikely that the granulosa cells of a true follicle could produce such a growth, because the life of granulosa cells is depending upon the fully functioning ovum. Even though granulosa and theca cells proliferate in the case of chorion-epithelioma or hydatiform mole, they always disappear after removal of the chorionepithelioma or mole, and thus could not any longer become responsible for the formation of a granulosa cell tumor. Structures which in these tumors resemble follicles, can never be considered

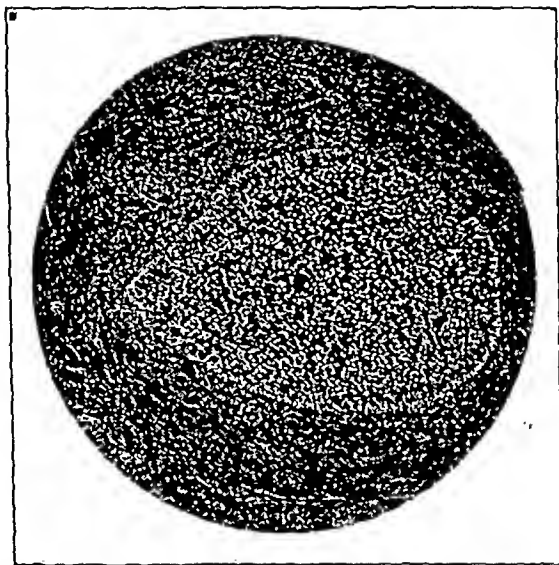


Fig. 5.—Solid masses of granulosa cells in the ovary of a woman forty-five years old.

the source of the neoplasm because they are only the products of the abnormal growth of these specific cells, as will be explained presently.

These granulosa cell tumors occur most frequently in women from sixty to seventy-four years of age, in whom the ovary no longer contains follicles. Therefore, in the majority of instances it is impossible to even think of their origin from follicle cells. We are forced to look for some other source, because granulosa cells which do not participate in the normal development and normal function of the ovarian tissue, will remain uninfluenced by the menopause.

We might assume that such unused granulosa cells would be situated chiefly in the medullary portion of the ovary because there we find masses of such cells in the ovary of every full-term fetus and also of most newborn girls (Fig. 4). It is of still greater significance that such solid masses of granulosa cells are also found in the ovaries of adults, as, e.g., in one woman, forty-five years of age (Fig. 5).

Such unused cells may remain in that undifferentiated state which is characteristic for the embryonic ovary where it is impossible to



Fig. 6.—Small granulosa cell tumors in the otherwise normal ovary of a woman forty years old.

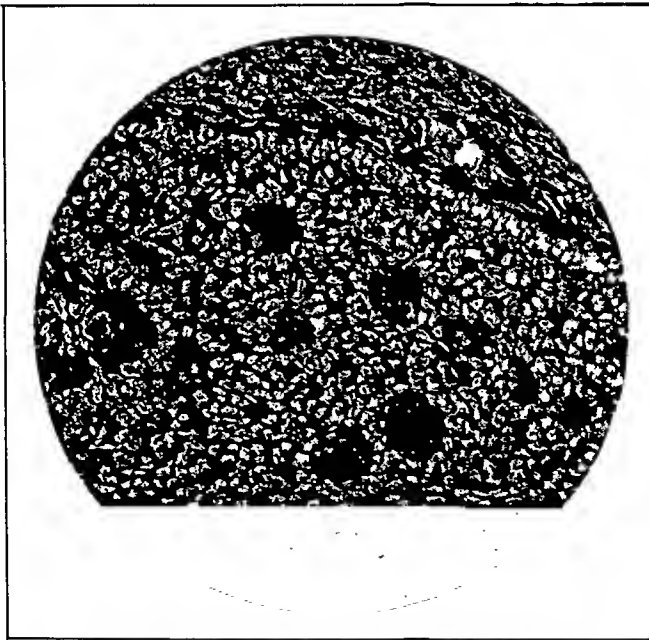


Fig. 7.—Same as Fig. 6. Higher magnification showing follicle-like structures.

make out any differences between individual cells. They seemingly can persist without further differentiation late into life, and thus we are led to the assumption that, under certain, still unknown condi-

tions, they might at any stage in children or in elderly women be able to produce granulosa cell tumors. Figs. 6 and 7 show in the medullary portion of an otherwise normal woman of forty years, proliferations of

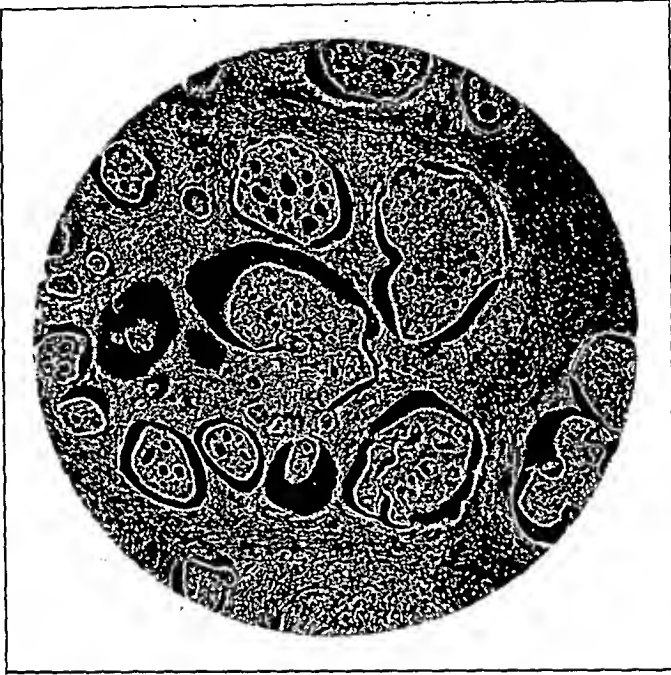


Fig. 8.—Folliculoma associated with cysts.

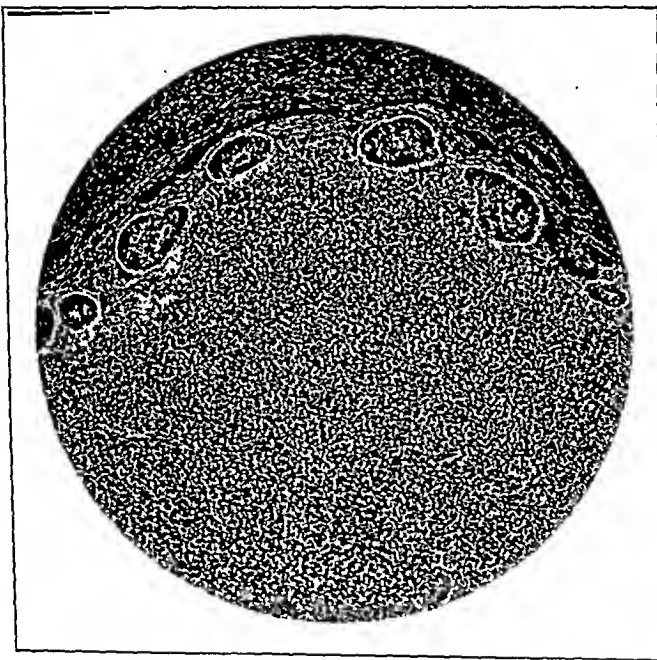


Fig. 9.—Solid masses of granulosa cell tumor.

granulosa cells which might well be looked upon as small tumors. The small cysts one can see in this specimen are neither follicles nor structures derived from follicular tissues because there is no ovum and no

theca interna. The epithelium is arranged quite irregularly and begins to penetrate into the connective tissue. This gives the same histologic appearance as seen in older tumors which contain hundreds and even thousands of such cysts.

Finally I wish to call attention to two cases reported by me some time ago in which the granulosa cell tumors arose from tissue attached to the ovary, proving some embryonic anomaly associated with this neoplasm.

Granulosa cell tumors are not by any means uncommon. Thirty-three cases collected by me include 3 children, 5 women at ages between twenty and thirty-nine years, 8 between forty and forty-nine years, and 7 women over fifty years old, among the latter there were

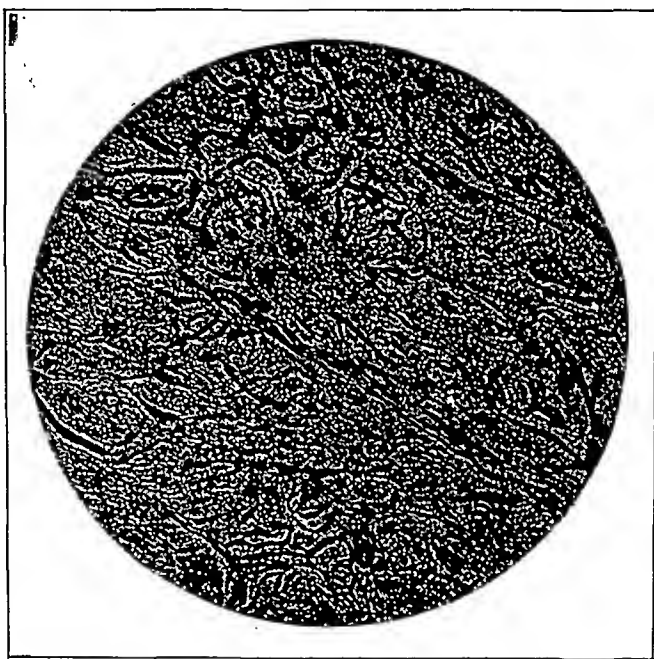


Fig. 10.—Interlacing cords in granulosa cell tumor.

5 over seventy years. Of these 33 cases, one woman died soon after operation and only 3 from later metastases. As far as I could ascertain 19 remained permanently cured after operation, most of them for more than one year, others for more than four years. Of the operated children, 2 were cured for more than ten years; one of them was operated upon at the age of five years and reoperated upon three years later for a recurrence, but then remained well.

In 27 of my cases bleeding was an important symptom. In all of those studied by me microscopically the endometrium was found to be hyperplastic and the uterus enlarged. After removal of the tumor abnormal bleeding stopped and in younger individuals, if not all the ovarian tissue was removed, menstruation again became normal.

So we must conclude that the hypertrophy of the uterus was caused by the ovarian neoplasm. Certainly hypertrophy of uterus and hyper-

plasia of endometrium seen in patients past the menopause must have been induced by the ovarian tumor. The endometrial hyperplasia in such women is due to the proliferation of granulosa cells, this prolif-

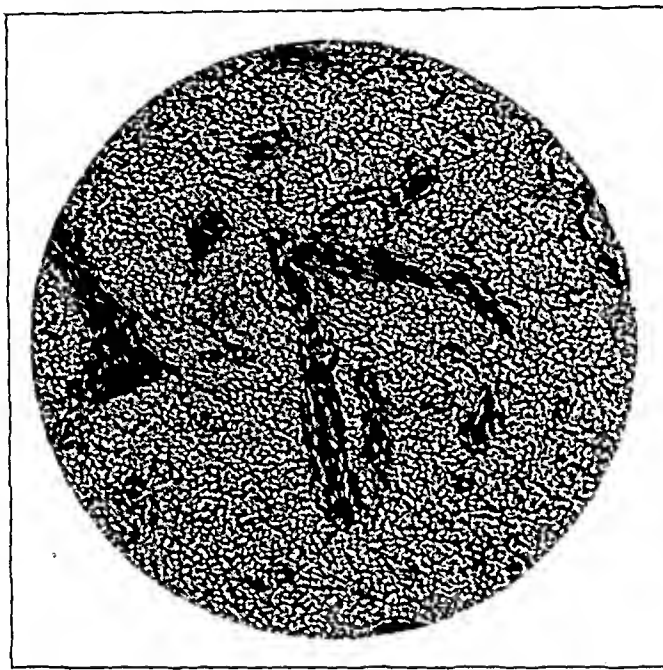


Fig. 11.—Solid, carcinoma-like granulosa cell tumor with hyaline degeneration.

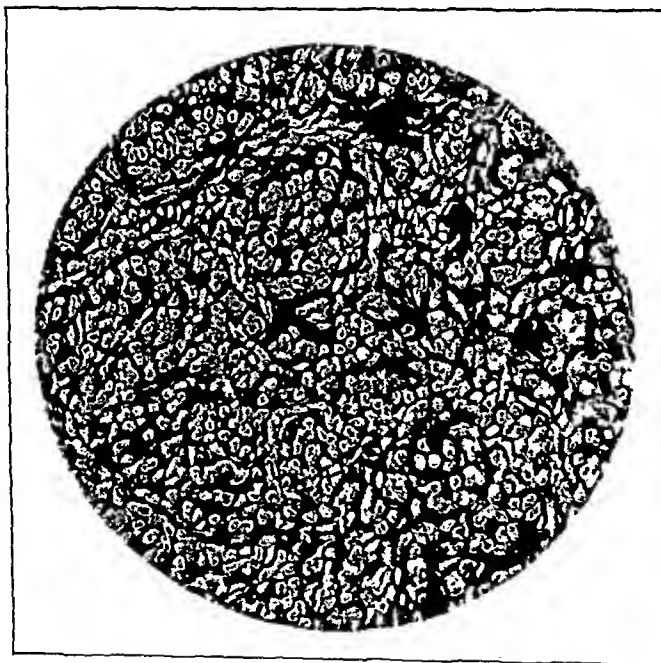


Fig. 12.—Diffuse granulosa cell tumor resembling a sarcoma.

eration resulting in augmented hormonal effect. Undoubtedly as the result of this latter effect we found in 2 cases hypertrophic breast glands, and saw a galactorrhea in 2 old women, sixty-one and seventy

years of age respectively. In one reported case there was discovered a well developed decidua in a hypertrophic uterus of a woman sixty-three years old.

In my own cases, 2 children, five and eleven years old, showed precocious development, uterine bleeding, hypertrophic breasts, one of the two even colostrum secretion. Thus we have both histologic and hormonal proof that these tumors arise from granulosa cells, and lead not only to precocity in the young but likewise to a sort of rejuvenation in older individuals.

III. ARRHENOBLASTOMA OF THE OVARY

The third class of tumors to be discussed in this paper is of particular interest in so far as they tend to cause women previously exhibit-

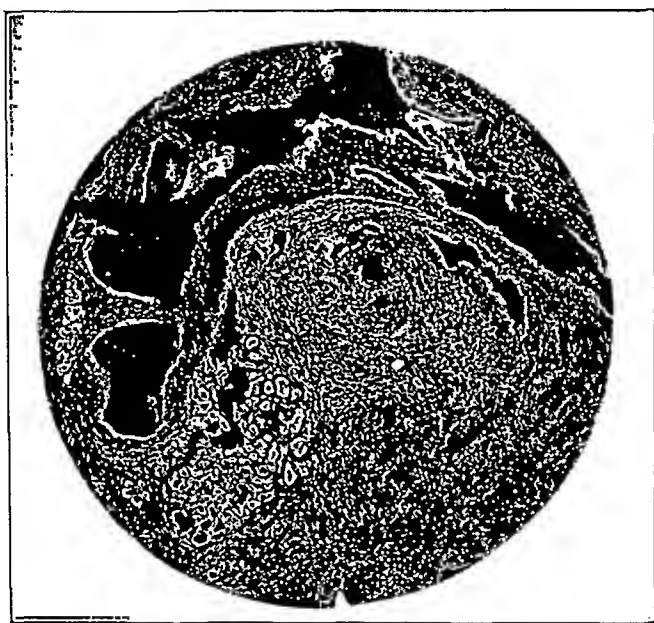


Fig. 13.—Tubular adenoma in the hilum of an adult ovary, attached to the rete ovarii.

ing normal female characteristics to take on those typical for the male sex. In these patients we notice such signs of defeminization as falling out of the hair of the head and deposits of fat. There is a coincident atrophy of the breasts, shrinkage of the opposite ovary when not affected, and atrophy of the uterus with consequent amenorrhea and sterility. At the same time positive signs of masculinization manifest themselves, such as male hirsuties, growth of a beard, enlargement of clitoris, hypertrophy of larynx with male voice and other male characteristics. These evidences of masculinization greatly diminish or disappear completely after extirpation of the ovarian neoplasm. The woman who is operated upon returns more or less fully to her former femininity. Menstruation reappears, even pregnancy may occur, as was the case in two of my own patients. On the other hand, the signs of masculinity return with a recurrence of the growth.

Thus we are justified in the conclusion that these particular tumors produce typical sex hormones, identical with those which stimulate the development of normal males, and that a deficiency in this stimulus

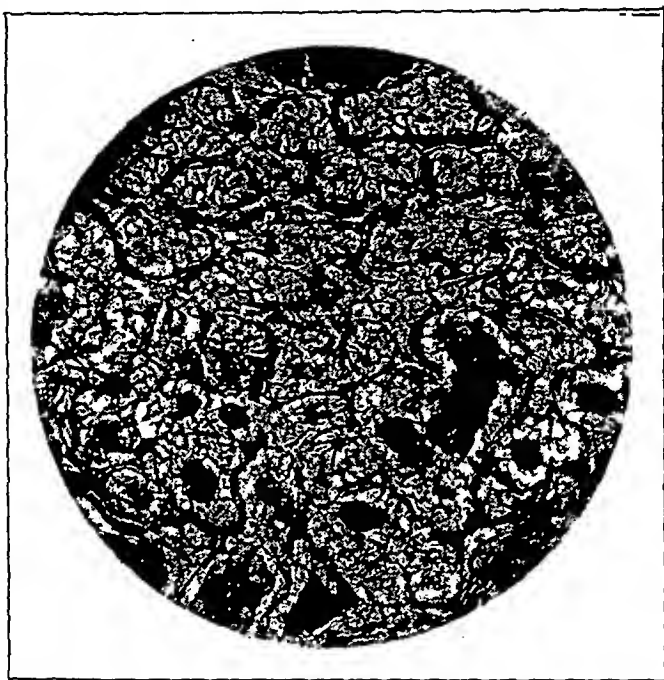


Fig. 14.—Same as Fig. 13. Higher magnification.

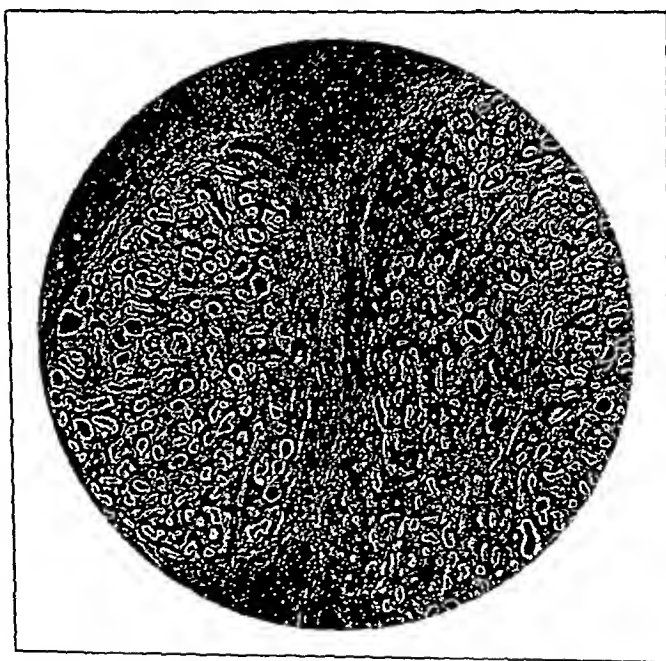


Fig. 15.—Adenoma tubulare testiculare (Pick).

results in hermaphroditism. The fact that they can produce male characteristics, in my opinion, does not of itself furnish sufficient ground to call them arrhenoblastomas (*arrhenos* meaning male).

There are different forms of this neoplasm. At least one of them, very characteristic in type, the so-called *adenoma tubulare testiculare* certainly does not induce somatic changes toward the male in all pa-

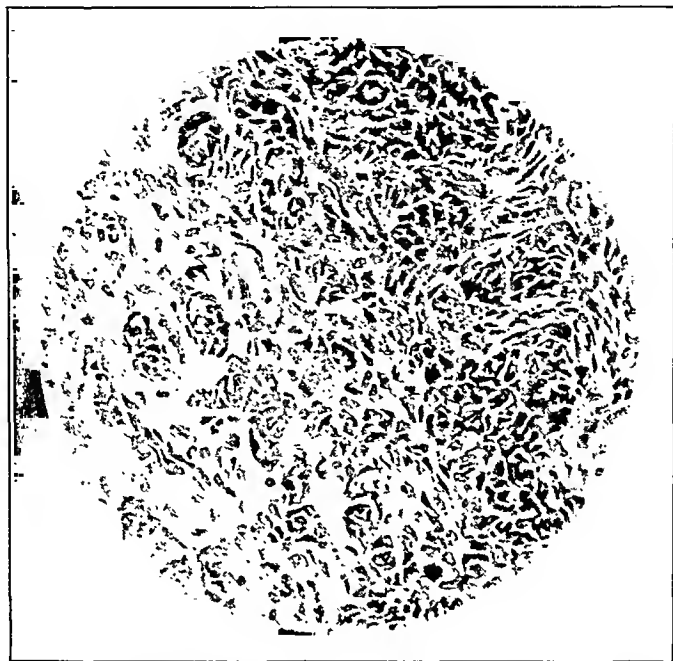


Fig. 16.—Adenoma tubulare testiculare associated with marked masculinization.

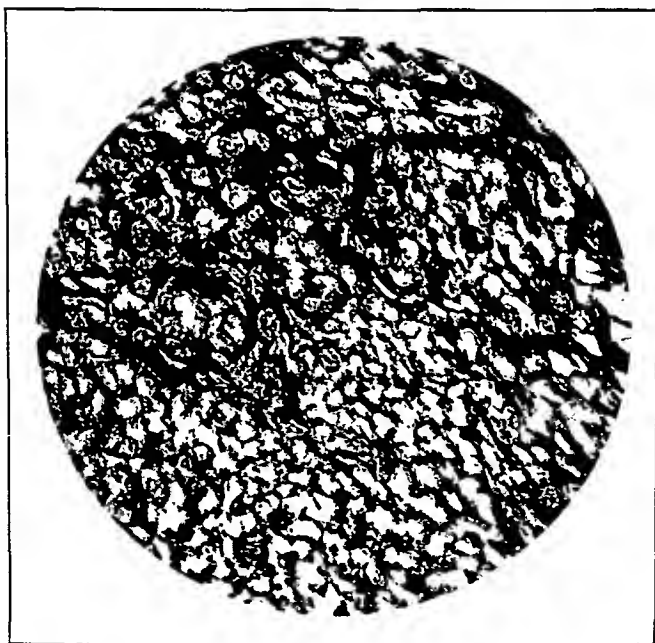


Fig. 17.—Adenoma tubulare testiculare associated with marked masculinization.

tients. Another reason for calling these tumors arrhenoblastoma of the ovary is based on the theory that, whether or not they produce male characteristics, they always arise from definitely male-directed

cells. I believe that they originate from undifferentiated germ cells which are not utilized during embryonic development and nevertheless retain their sexual potency. Under certain external conditions they begin later in life to proliferate and then only begin to exert an influence in the direction toward maleness.

A site particularly predisposed to initiate this change of sexuality I believe to be the hilum of the ovary. In every embryonic sex gland undergoing development into an ovary, cells of the hilum remain for some time in an undeveloped state (blastema). This blastema under normal conditions later on produces the rete ovarii and some medullary cords or tubules which are homologues of the rete testis and the tubuli efferentes of the testicle in the male.

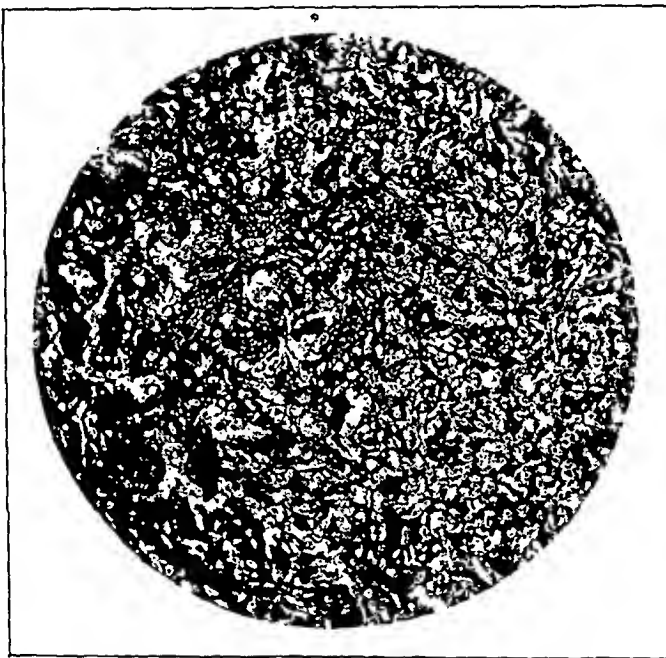


Fig. 18.—Adenoma tubulare testiculare associated with marked masculinization.

The future sexual character of the young embryo is not unalterably determined from the beginning, at least not in all instances, but does depend upon determining factors in the genes of the chromosomes. A priori every embryo and also every embryonic sex gland has the potential faculty of developing into either the male or female direction.

The rete ovarii and the medullary tubules, which do not exert any functional influence on the female sex gland, prove the normal bisexual *anlage* of the gonads. If these structures then persist in part in an undifferentiated state, and later for unknown reasons begin to proliferate, they may induce a male direction of development and thus change the sexual characteristics by creating bisexual stimulation like an ovariotesis.

In the hilum of an adult ovary, I found a small tubular adenoma in

a very young stage attached to the rete, which proves this type of neoplasm may have its origin just in this location (Figs. 12 and 14). Therefore it is not the hormonal effect alone which justifies the name

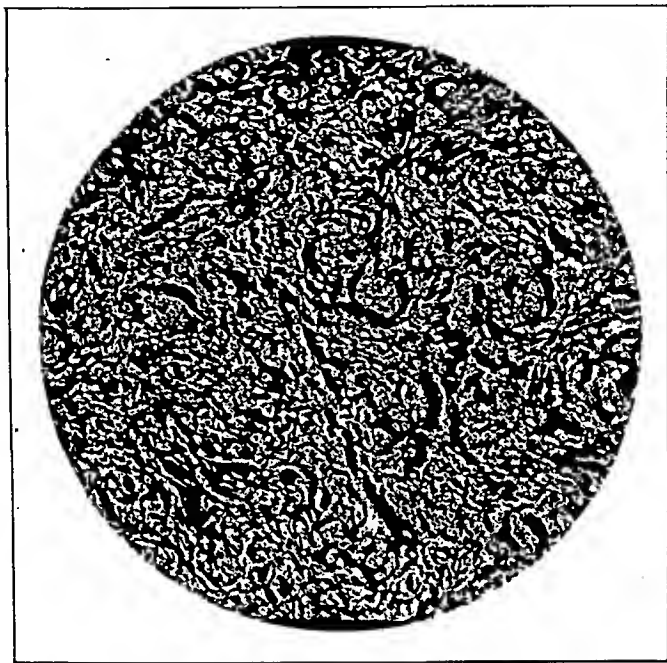


Fig. 19.—Adenoma tubulare testiculare sarcoma-like in structure.

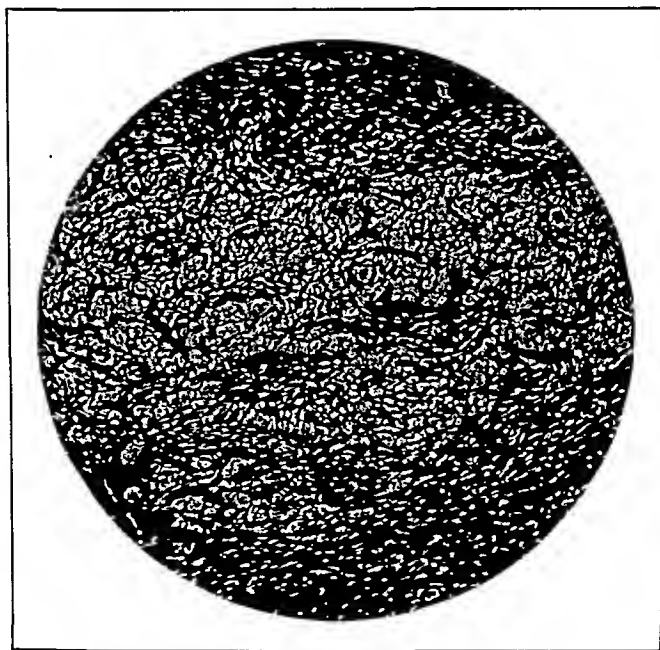


Fig. 20.—Adenoma tubulare testiculare with rudimentary cords.

arrhenoblastoma but the fact that the resulting masculinization confirms the theory of the origin of this newgrowth.

These tumors occur in two distinct morphologic forms and a third which holds an intermediary position. The first form is already

known as adenoma testiculare, so named by Pick, because it is not only similar to the adenoma developing in men in the testicle but also contains the same structures (Fig. 15).

As already mentioned, with this particular growth masculinization occurs only occasionally, in 3 out of a total of 9 cases so far reported.

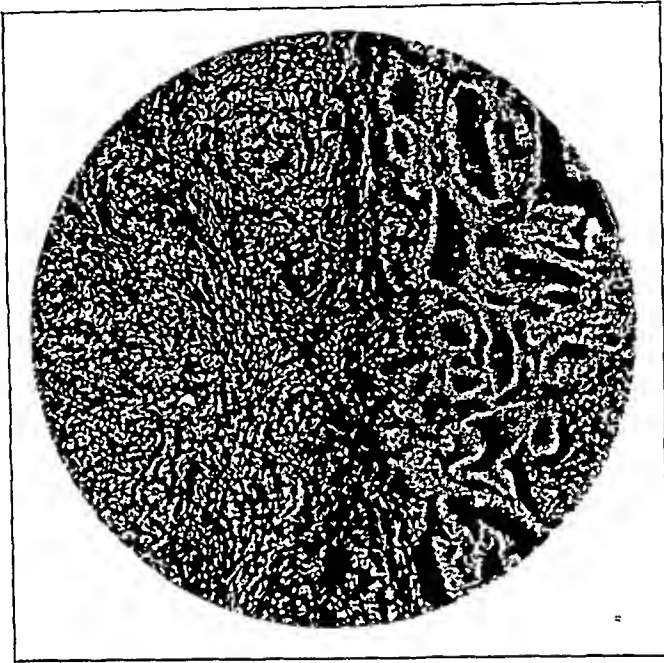


Fig. 21.—Adenoma tubulare testicularis with irregular tubules.

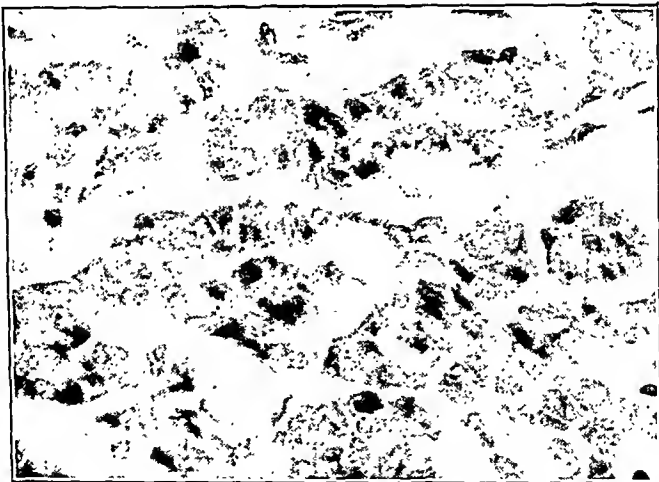


Fig. 22.—Adenoma tubulare testicularis with structures resembling seminal tubules.

I believe that the degree of masculinization depends in some way upon the extent of atypical proliferation of the newly developed tissue as testicular tissue. I wish to emphasize that one cannot assert, as was formerly done by Pick, that these adenoma necessarily originate from a true ovariortestis, because women afflicted with such tubular adenoma have not exhibited the signs of intersexuality since birth, as would be the case with all individuals having a real ovariortestis. Fur-

thermore, hermaphrodites with testicles or with ovariotesis have never been known to develop tumors which change their female characteristics toward masculinity.

Out of another class of tumors (11 cases), I had the opportunity to examine 9 which were associated with a high degree of masculinization. These epithelial tumors were quite atypical (Figs. 16, 17, and 18), often showing sarcoma-like structure (Fig. 19) but with rudimentary cords (Fig. 20) or consisting of irregular tubules (Fig. 21) which only rarely resemble seminal tubules (Fig. 22).

Notwithstanding marked differences between these two classes of tumors I believe that they have a common genesis. I can prove this on 6 other cases where the morphology varies from the one class (Fig. 23) to the other (Fig. 24). Women with this intermediary type of

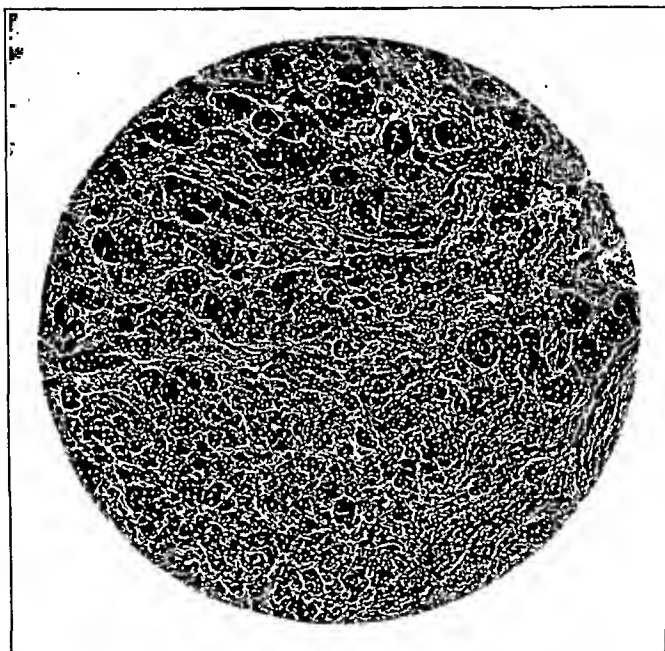


Fig. 23.—Arrhenoblastoma ovarii showing the features both of the adenoma of tubular type and of atypical epithelial growth.

ovarian tumor showed a slighter degree of masculinization than the others. They always lost their menstrual flows, sometimes they developed beards, male hirsuties and a deeper voice. I diagnosed these 6 cases of the intermediary type solely from the microscopic study of the neoplasm without knowing anything about history or physical findings. In all 6, later examination revealed the signs of defeminization and masculinization respectively.

Also in three specimens from the above mentioned atypical cases, which were shown to me by my colleagues, I immediately recognized the characteristic structures of the tumor and was able to state what the clinical findings would be.

Once again it must be stated emphatically that not all types of ovarian neoplasms exert a hormonal effect, i.e., are capable of de-

feminizing or of actually masculinizing the patients as formerly was thought, but only certain tumors which possess distinct morphologic and biologic characteristics.

It is of great importance for the gynecologist to know that patients afflicted with this type of newgrowth: disgerminoma, granulosa cell tumors, and arrhenoblastoma, are cured by operation in most instances and that it is not necessary to remove the opposite ovary if it is seemingly unaffected. However, the disgerminoma occurs bilaterally in 20.8 per cent of the cases. Even if the uterus was found involved in the process, operation leads to cure, though French writers speak of a high mortality in this disease. It certainly is unnecessary to remove prophylactically the other ovary in young persons. For this

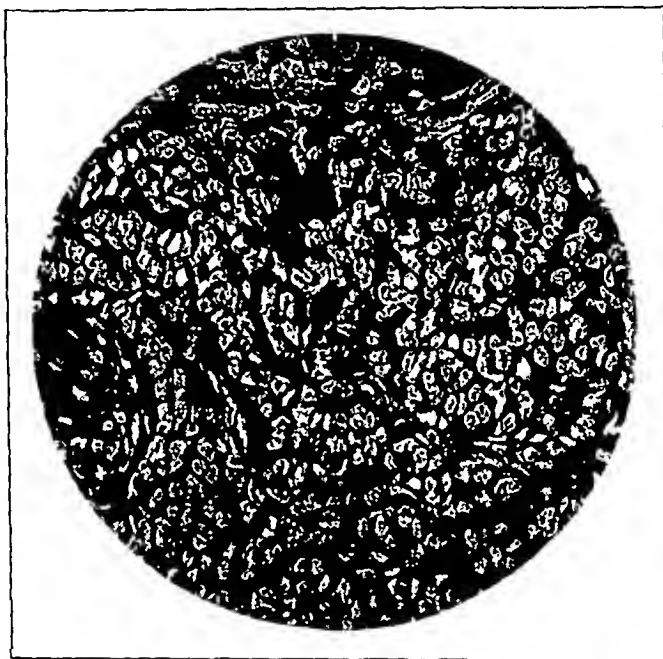


Fig. 24.—Same as Fig. 23.

reason alone it is important that the gynecologist learns to differentiate between these 3 forms of ovarian neoplasms even macroscopically.

It is essential to differentiate the signs of hermaphroditism from those of hypoplasia of the genital organs. In the cases of disgerminoma one must look for evidences of masculinization though such changes are common only with the arrhenoblastomas.

In conclusion, I will say that it has become most desirable to establish the hormonal activity so characteristic for these neoplasms in animal experiments, by transplantation, or injection of tumor extracts.

REFERENCES

- Meyer, Robert:* Ztschr. f. Geburtsh. u. Gynäk. 77: 506, 1915. Arch. f. Gynäk. 109: 1918. Arch. f. Gynäk. 123: 675, 1925. Zentralbl. f. Gynäk. 49: 1244, 1925. Beitr. z. path. Anat. u. allg. Path. 84: 485, 1930. Ztschr. f. Geburtsh. u. Gynäk. 98: 149, 1930. Zentralbl. f. Gynäk. 54: 2374, 1930. Ztschr. f. Geburtsh. u. Gynäk. 98: 543, 1930. Verhandl. d. deutsch. path. Gellsch. p. 328, 1930. Klin. Wchnschr. 9: 2237, 1930. Arch. f. Gynäk. 145: 2, 1931.

THE SIGNIFICANCE OF INCOMPLETE FUSION OF THE
MÜLLERIAN DUCTS IN PREGNANCY AND PARTURITION, WITH A REPORT ON 35 CASES*

BY FRANK R. SMITH, M.D., NEW YORK, N. Y.

(From the Lying-In Hospital)

MOST gynecologists during a lifetime of practice encounter one or more patients having a so-called double uterus. Many obstetricians see one or more pregnant women who have a double uterus, and if by chance more than one such patient is seen within a short interval of time, the quite naturally expressed opinion is that these cases occur "fairly frequently." This paper is concerned only in the significance of incomplete fusion of the müllerian ducts in pregnancy and parturition.

* * *

Many of the cases reported are unusual in the situations encountered and in the methods by which they were handled. It is of interest that of 156 references on the subject reviewed by me, the conclusions were drawn from a single observed case in 102 instances, from 2 cases in 29 instances, from 4 cases in 16 instances and from 8 or more cases in only 9 instances. Many of these authors, however, also analyzed previously reported cases. Puddicombe³³ sounds the keynote of most of the case reports in stating that operative procedures are advisable in view of future pregnancies. Two recent authors,²² reporting one case, have concluded, "Treat pregnancy in a double uterus as an unruptured ectopic; empty the uterus and correct the maldeveloped region. Be prepared for a severe postpartum hemorrhage and be ready for a stormy puerperium." This is not exactly in keeping with the impression to be gathered from the cases presented in this report.

* * *

It has been my privilege to collect from the records of 141,946 consecutive pregnancy patients at the New York Lying-In Hospital, from January, 1899, to July, 1930, 35 cases with double uteri, 19 of whom have come under my personal observation through the courtesy of the late Doctor Asa B. Davis. These 35 cases are reported in order of occurrence. The conclusions have been reached by comparison with normal patients. Where possible, the figures for comparison have been taken from the Annual Reports of the Hospital. Some comparison figures, which were not otherwise available, have been obtained

*Read by invitation, before the New York Obstetrical Society, Feb. 10, 1931.

Because of its length this paper cannot be printed in full in the JOURNAL, but the complete article may be found in the author's reprints.

by analyzing 5,000 consecutive case records of pregnancy patients. These cases will be referred to as the Control Group. Where other controls are used, the source will be indicated. While admitting the obvious criticism, that 35 cases is a very small number from which to draw conclusions, it is hoped that the comparison with normal cases will warrant the conclusions reached.

(Detailed case reports may be found in the author's reprints.)

COMMENTS

Frequency of Occurrence.—It is somewhat confusing to note that all types of double uterus occurred once in 1,458 cases during the five and a half years of personal observation by the writer, whereas the record of 114,243 consecutive cases covering the period from January, 1899, to December, 1924, show double uteri occurring only once in 7,040 cases. It will be assumed that some cases either were not recognized, since the type of uterus can be determined only by intrauterine examination, or were not recorded. Several cases recorded as double uteri were clearly shown from the recording description to be simple bicornate uteri or uterus arcuatus and were not included in this series. It seems fair to conclude, however, because of the greater facilities for observation at present, that the probable frequency of occurrence of pregnancy in double uteri is about one in 1,500 cases. These figures give no definite conclusions as to the frequency of occurrence regardless of pregnancy, nor as to the comparative fecundity of women with double uteri.

TABLE I. FREQUENCY OF OCCURRENCE

NO. OF CASES IN SERIES	NO. CONSECUTIVE OBSTETRIC CASES	FREQUENCY
35	141,946 (January, 1899 to July, 1930)	1-4,055
16	114,243 (January, 1899 to December, 1924)	1-7,040
19	27,703 (January, 1925 to July, 1930)	1-1,458

Frequency of Occurrence of the Individual Types of Uteri.—The most frequently found types of double uteri (uterus bicornis subseptus unicolis vagina simplex, type 1) and the type illustrating the most complete failure of fusion of the müllerian ducts (uterus didelphys, type 3) show fairly constant frequency of occurrence, whether taken from the entire number of patients considered or from those under my personal observation. Of the other types there is a wide variation in the frequency of occurrence. It is evident that as types 2, 4, 5, 6, and 9 occurred only in the series under my personal observation that each type frequency of occurrence should be taken as the figure obtained from that series. As types 7 and 8 occurred so infrequently in the series and not at all in my personally observed series, the frequency of occurrence is taken as the figure obtained from the total series for these types. There was no case recorded of a rupture of a pregnant

horn of a double uterus and a careful review of the 125 ectopic gestations found, failed to reveal any hint that any one of these had been mistaken for a pregnancy in a horn of a double uterus. There was no case of uterus unicornis found. All of these types were classified after intrauterine examination.

TABLE II. TYPES OF UTERI WITH THEIR FREQUENCY OF OCCURRENCE

TYPES OF UTERUS	NO. IN 141,946 CASES	FREQUENCY	NO. IN 27,703 CASES	FREQUENCY
Bicornis subseptus unicollis vagina simplex	12	1-11,829	3	1-9,234
Bicornis unicollis vagina duplex	8	1-17,730	8	1-3,464
Uterus didelphys	5	1-28,389	1	1-27,703
Septus duplex bicornis vagina duplex	2	1-70,973	2	1-13,851
Duplex bicornis bicornis vagina simplex	2	1-70,973	2	1-13,851
Bicornis cum vagina duplex	2	1-70,973	2	1-13,851
Subseptus uniformis	2	1-70,973	0	
Subseptus unicollis cum septate vagina	1	1-141,946	0	
Bicornis unilatera rudimentaris vagina duplex	1	1-141,946	1	1-27,703

Classification and Comparison of Birthplace.—These percentages are obtained from the figures published in the Annual Reports of the Society of the Lying-In Hospital. If the years 1924-25 to 1929 alone are used for comparison, one is impressed with the high comparative percentage of Russian- and Italian-born patients having double uteri, but when the previous years, of which 1905, 1910 and 1915 seem a fair representation, are considered it is evident that the hospital clientele has undergone a changing character as to nationality, especially as to the diminishing proportions of Russians and Austrians and the increase of Italians. Even as far back as 1910 since which time the percentage of patients born in the United States and confined at

TABLE III. CLASSIFICATION AND COMPARISON* OF BIRTHPLACE

BIRTHPLACE	NO.	PER CENT OF TOTAL	PER CENT 1924 1925	PER CENT 1926	PER CENT 1927	PER CENT 1928	PER CENT 1929	PER CENT 1905	PER CENT 1910	PER CENT 1915
U. S. A.	5†	14.2	31.6	31.0	40.6	38.9	46.5	10.1	19.4	20.7
Russia	11	31.8	17.8	18.6	7.9	6.6	6.1	61.9	42.2	36.9
Italy	9	25.7	11.8	14.9	14.2	14.0	14.0	0.6	3.0	5.9
Austria	1	2.6	5.9	5.0	4.8	4.6	4.1	13.7	13.7	17.1
Spain	2									
Germany	2									
Roumania	1									
Ireland	2	25.7	32.8	30.5	32.5	35.4	29.3	13.6	21.6	19.4
Finland	1									
Greece	1									

*Comparison figures taken from Annual Report Lying-In Hospital.²⁵

†One colored patient.

Lying-In Hospital has steadily increased, the comparison percentages of American-born patients exceeded constantly that of the double uteri series. Whether or not this is due to improved living conditions in this country is for speculation only.

Comparison of Number of Pregnancies, Age, Marriage Interval, and Incidence of Pregnancy.—The proportion of primiparae in the series exceeds that of the controls; the average age for primiparae is greater and for multiparae is less; the range of age compares favorably; the percentage over thirty years of age of primiparae is greater and of multiparae is less, the incidence of pregnancy is about the same; the interval between marriage and the birth of the first child is more than twice as great. As to fecundity there are no comparison figures available but we may assume, because of the greater average age of the primiparae, the greater the interval between marriage and the first childbirth in the double uteri series and because the incidence of pregnancy is about equal in the two series, that patients with double uteri show less tendency to become pregnant, but once having become pregnant the incidence equals that of normal individuals.

TABLE IV. COMPARISON OF SERIES WITH CONTROL SERIES AS TO NUMBER OF PREGNANCIES, AGE, MARRIAGE INTERVAL, AND INCIDENCE OF PREGNANCY

CLASSIFICATION	COMPARISON	TOTAL	PRIMIPARAE	MULTIPARAE
No. of cases	Series	35	19	16
	Control	5,000	1,982	3,018
Percentage	Series	100	54.2	47.7
	Control	100	39.7	60.2
Average age in years	Series	25.6	26.2	25.0
	Control	26.4	23.6	28.6
Youngest	Series	16	16	18
	Control	15	15	18
Oldest	Series	45	45	32
	Control	52	43	52
Number over 30 years	Series	8	6	2
	Control	1,261	242	1,019
Percentage over 30 years	Series	22.8	31.5	12.5
	Control	25.2	12.2	33.7
Marriage interval	Series 18 cases*	4.5 years		
	Special control†	2 years		
Incidence of pregnancy No. cases including abortions	Series	81	2.31 preg. per case	
	Control	11,386	2.27 preg. per case	

*Based on special control series.²⁹
†Information available from only 18 cases.

Classification of Abortions and Comparison With the Control Series.—The percentage of abortions in the double uteri series is nearly 5 times as great as in the controls; the proportion of primiparae to multiparae in the series is as 3 to 2 whereas in the controls this proportion is as 3 to 4; the percentage of multiparae with previous abortions is higher in the series than in the controls. The multiparous breeches and abortions make up the entire percentage of cases in the double

uteri with previous abortions (no cases with vertex presentation in this series had had a previous abortion), whereas in the controls, the percentage of breeches with previous abortions is only slightly higher than that of cases with vertex presentations having had previous abortions. This suggests that the factors causing breech and transverse presentations also cause abortions, especially in double uteri. The percentage of patients with more than one previous miscarriage was more than three times that of the control series; the percentage of total miscarriages in the total number of pregnancies is nearly twice as great in the double uteri series as in the controls. Noting from Table IV that the incidence of pregnancy was about equal, it is significant that the number of pregnancies for each abortion is less in the series than in the controls, though the series figure is well within the limits of the estimated figures of Malins and Taussig. An evident conclusion is that double uteri have an increased tendency to abortion and it seems probable that this tendency is greatest in the types resulting in breech or transverse presentation.

TABLE V. CLASSIFICATION OF ABORTIONS AND COMPARISON WITH CONTROLS

CLASSIFICATION	SERIES		CONTROL		COMPARISON		
	NO.	PER CENT	NO.	PER CENT	Williams	Malins	Taussig
Total abortions	5	12.8	149	2.9			
Primiparae abortions	3	60.0	63	42.2			
Multiparae abortions	2	40.0	86	57.7			
Multiparae with previous abortions	8	50.0	955	35.9			
Multiparae breeches with previous abortions	6	47.7*	42	34.1†			
Multiparae vertices with previous abortions	0	0	891	31.3‡			
Multiparae abortions with previous abortions	2	100	22	25.5§			
Patients with more than one previous abortion	5	38.4	325	12.2			
Total number of pregnancies past and present	81	100	11,386	100			
Total miscarriages past and present	19	23.45	1,657	14.5	6.0%	19.23%	30.0%
Number of pregnancies for each abortion	4.2		6.8		16.6	5.0	3.3

*Percentage of total multiparous breeches (13) in series.

†Percentage of total multiparous breeches (123) in controls.

‡Percentage of multiparous abortions.

§Percentage of multiparous vertices.

Comparison as to the Period of Gestation and Weight of Babies.—Here is shown that the percentage of ten months' gestation is considerably smaller and that of the nine months' gestation is considerably larger in the double uteri series than in the control group; the percentage of eight and six months' gestations are fairly constant in the series and in the control group.

The average weight, the percentages of babies weighing more than 3,200 gm. and more than 2,800 gm. respectively, are considerably less than comparison figures for the control group; also and quite naturally, the percentages of babies weighing less than 2,800 gm. and less than 2,000 gm. respectively, are greater for the series than for the control group.

TABLE VI. COMPARISON AS TO PERIOD OF GESTATION AND WEIGHT OF BABIES

CLASSIFICATION	SERIES		CONTROL	
	NUMBER	PER CENT	NUMBER	PER CENT
Total number babies	34*	100	4818†	100
10 months' gestation	14	41.2	3458	71.7
9 months' gestation	15	44.1	953	19.7
8 months' gestation	2	5.8	244	5.0
7 months' gestation	2	5.8	65	1.3
6 months' gestation	1	2.9	98	2.0
Total number babies	34	100	4912‡	100
Average weight in gm.	2991		3337	
Babies over 3200 gm.	16	47.0	2898	59.3
Babies over 2800 gm.	24	70.5	4289	87.3
Babies under 2800 gm.	10	29.4	623	12.7
Babies under 2000 gm.	3	8.8	95	1.9

*Total 34 = 39 pregnancies, 5 abortions.

†Total 4,818 = 5,000 patients including 59 twins and one triplets, 149 abortions, 92 cases in which period of gestation not known.

‡Total 4,912 = 5,000 patients including 59 twins and one triplets, 149 abortions.

Side of Uterus Containing Fetus.—In only 30 pregnancies was the side known, and from the figures of this series it would seem that there is a slightly greater tendency (4 to 3) to pregnancy in the right side. The one case of twins had one baby in each side; two patients delivered twice, had the pregnancy alternating; one patient delivered twice had the pregnancy in the same side each time. The position of the presentation showed a slight tendency (4 to 3) to be the same as the side of the uterus occupied.

TABLE VII. CLASSIFICATION OF PREGNANCIES AS TO THE SIDE OF UTERUS CONTAINING THE FETUS

SIDE OF UTERUS CONTAINING PREGNANCY	NUMBER OF PREGNANCIES
Left side only	12
Right side only	16
Both sides (1 set twins)	2
Total pregnancies available	30
Side not known	9
Alternating sides (2 cases)	4
Position same as side of uterus	12
Position and side of uterus opposite	9

Classification of the Side of the Uterus Having the Placental Site and Comparison With the Control Group as to Manual Removal of the Placenta.—It is consistent with Table VI that there should be a slightly increased tendency for the placenta to be in the right side of

the uterus. In the one case of twins both sides of the uterus had placental sites. In 4 cases the placental site was central. The side alternated in 2 cases delivered twice and was the same in one case delivered twice. In 4 cases the placenta was also located on the septum of the uterus. In 1 case the placenta was on one side and the baby on the other. In comparing the percentages requiring manual removal of the placenta, the percentage in the double uteri series greatly exceeded that of the control group. However, the proportion of those placentas removed for bleeding to those for adherent placentas was 1 to 4.5 for the double uteri series, whereas in the control group twice as many cases had a manual removal for bleeding as for adherent or retained placentas.

TABLE VIII. CLASSIFICATION OF THE SIDE OF UTERUS FOR PLACENTAL SITE AND COMPARISON WITH CONTROLS, AS TO MANUAL REMOVAL OF THE PLACENTA

CLASSIFICATION: SIDE OF UTERUS	SERIES			CONTROL		
	NO. PLACENTAS	NO. CASES	PER CENT	NO. PLACENTAS	NO. CASES	PER CENT
Left side only	11					
Right side only	17					
Both sides (1 set twins)	2					
Central	4					
Total available sites	34					
Side not known	5					
Alternating sides (2 cases)	4					
Placenta also located on septum	4					
Placenta on 1 side: Baby on other	1					
Manual removal of placenta, excluding abortions and cesarean sections	11	29*	37.9	27	4772†	0.57
Manual removal for bleeding	2	29	6.8	18	4772	0.37
Manual removal for retained placenta	9	29	31.0	9	4771	0.19

*Placentas in series minus 5 abortions and 5 cesarean sections.

†5,061 placentas minus 149 abortions and 139 cesarean sections in control series.

TABLE IX. CLASSIFICATION AS TO PRESENTATION COMPARED WITH THREE CONTROL GROUPS

LYING-IN SERIES							COMPARISONS			
CLASSI- FICATION	TOTAL		PRIMI- PARAE		MULTI- PARAE		SOURCE	TOTAL CASES	NO. BREECHES	PER CENT
	NO.	PER CENT	NO.	PER CENT	NO.	PER CENT				
Total babies	39*	100	19		20		(25) Pinard	100,000	3,301	3.3
Breech	21†	53.8	8	42.1	13	65.0	(27) N. Y. L.-I.	5,457	140	2.5
Vertex	13	33.3	8	42.1	5	25.0	1924			
Abortions	5	12.8	3	15.7	2	20.0	Control	5,061‡	176	3.4

*3 Patients in series delivered twice, 1 twins = 4 additional babies, total 39.

†6 Breeches were really transverse.

‡5,000 Patients plus 59 twins plus 1 set triplets.

Classification as to Presentation Compared With Three Control Series.—It is evident from this table that the frequency of breech or

transverse presentations in double uteri is out of all proportion to their frequency in the three groups used for comparison.

Classification of Previous Presentations in Multiparae.—Of the multiparae in the double uteri series, 75 per cent had had breech presentations.

TABLE X. CLASSIFICATION OF PREVIOUS PRESENTATIONS IN MULTIPARAE

CLASSIFICATION	NO.	EXPLANATION OF PREVIOUS DELIVERY
Total multiparae in series	16	{ 3 patients delivered twice
Total babies of multiparae	20	
Multiparae with breech when first delivered at New York Lying-In Hospital	9	{ 1 twins
Breech cases having at least 1 previous breech	4	{ Para 5 All breech cases
Breech cases having more than 1 previous breech	3	
		{ Para 6 { 1 vertex 1 breech
		{ Para 7 All breech cases
		{ Para 4 { 1 breech 1 vertex 1 breech
		{ Para 8 { 4 miscarriages 3 normal vertex
Breech cases not having 1 previous breech	5	{ Para 2 Vertex
		{ Para 2 Normal vertex
		{ Para 3 2 miscarriages
		{ Para 6 { 1 normal vertex 4 miscarriages
Vertex at first delivery at Lying-In Hospital	5	
Vertex with previous breech	3	
Vertex not having a previous breech	2	{ Para 4 3 normal vertex
		{ Para 3 2 normal vertex
Incomplete abortions at first delivery at Lying-In	2	{ Para 2 Both miscarriages
		{ Para 5 { 2 normal vertex 2 miscarriages
2 abortions	{	Had no breech at any time = 25 per cent of total
2 vertices		
75 per cent of multiparae had a breech at some time		

Classification and Comparison as to Duration of Labor.—The average duration of labor for the 23 available cases of the double uteri series, including 13 primiparae, was several hours longer than the corresponding figures for the control group, but the average for multiparae in both groups was the same. The fact that 65.1 per cent of the double uteri series had dry labors, as compared with 20.7 per cent for the control group may partially explain the longer duration of labor. The average duration of labor for breech presentation in the double uteri series was shorter than the average for the total series, whereas in the control group it about equalled the total average, so the increased duration cannot be explained by the large proportion of breech presentations in that series.

Comparison as to Methods of Delivery.—The classification is in three groups; breech and vertex presentation and abortions, to which is added a collective classification and comparison. The total percent-

TABLE XI. CLASSIFICATION AND COMPARISON AS TO DURATION OF LABOR

CLASSIFICATION	NO. CASES	TIME	COMPARISON TIME			
			WIL- LIAMS	VEIT	CON- TROL	NO. CASES
Total	35					
Average time of labor	23	20 hr. 25 min.			15 hr. 30 min.	4,695
Not in labor	2					
Duration of labor not known	5					
Duration labor in abortions	5	Not known				
Average duration labor, primip- arae	13	25 hr. 25 min.	18 hr.	20 hr.	19 hr. 8 min.	1,982
Longest primiparous labor	1	57 hr. 25 min.				
Shortest primiparous labor	1	8 hr.				
Average duration labor, multip- arae	10	13 hr. 12 min.	12 hr.	12 hr.	13 hr. 10 min.	2,713
Longest multiparous labor	1	36 hr.				
Shortest multiparous labor	1	1 hr.				
Dry labor	15 (65.1%)	27 hr. 10 min.	*		19 hr. 36 min.	956 (20.7%)
Average duration breech labor	16	18 hr. 18 min.			15 hr. 36 min.	168

*Williams: 1 dry labor to each 10 labors (10 per cent).

ages in each group are taken as the percentages of the entire number of pregnancies in that series; the other percentages are of the total number of pregnancies in that group for each of the series.

In the double uteri series all of the cesarean sections were performed for contracted pelves, whereas the control group included those performed for other causes (placenta previa, etc.). The markedly higher percentage of cesarean sections in the series seems to indicate a greater incidence of contracted pelves in patients with double uteri. The proportion of cesarean sections in breech and vertex presentations is practically the same in the corresponding series and group.

In the group presenting by breech the percentage of deliveries by breech extraction is lower than in the controls owing to the tendency to contracted pelves requiring cesarean section delivery.

In the group presenting by vertex the percentage of spontaneous deliveries is considerably lower than in the control group.

The operative deliveries for the control group include a large proportion of low forceps while there were no such cases in the double uteri series.

The incidence of abortion, as in Table V, is considerably higher than in the controls.

In the comparison as to all presentations (excluding abortions), the percentage of operative deliveries is 4.5 times that of the control group, owing largely to breech extractions and cesarean sections due to contracted pelves. However, when all version and forceps deliveries are compared, the percentage is about equal.

TABLE XII. SERIES AND CONTROLS COMPARED AS TO METHOD OF DELIVERY

PRESENTATION	METHOD OF DELIVERY AND CLASSIFICATION	PATIENTS	SERIES PREGNANCIES		CONTROL PREGNANCIES	
			NO.	PER CENT	NO.	PER CENT
Total	Deliveries		39	100.0	5,061	100.0
Breech	Total deliveries		21	53.8*	176	3.4*
	Cesarean section (1 patient delivered twice)		3	14.2	5	2.8
Per cent taken of total breech cases	By breech extraction		18	85.7	171	97.1
	Accouchement forcé	4				
	For (a) Delayed labor	2				
	(b) Prem. sep. placenta	1				
	(c) Prolapsed cord	1				
Vertex	Total deliveries		13	33.3*	4,736	93.5*
	Spontaneous		7	53.8	4,053	86.5
	By all types of operative delivery		6	46.1	683	14.4
	Cesarean section		2	15.3	134	2.8
	(a) Funnel pelvis with fibroid	1				
	(b) Hydrocephalus	1				
	High forceps		2	15.3	10	0.2
	(a) Second twin delayed labor	1				
	(b) Delayed labor, attempted version	1				
	Medium A forceps for delayed labor (57 hr.)		1	7.7	114	2.4
	Version and extraction		1	7.7	100	2.1*
	Total		5	12.8*	149	2.9*
Abortions	Curettage and packing for incomplete abortion	4				
	Anterior vaginal hysterotomy for inevitable abortion	1				
	Total deliveries		34	79.5	4,912	17.7
	All operative deliveries†		27	11.7	859	11.0
	Version and forceps		4	14.7	544	2.8
	All cesarean sections		5		139	

*Per cent taken of total deliveries.

†Including breech extraction.

Comparison of Series and Controls as to Maternal Mortality and Morbidity.—There was one death in the double uteri series which gives a high mortality percentage when compared with the controls. This death in a gravida 6, para 2, was due to shock following accouchement forcé and breech extraction for premature separation of the placenta with concealed hemorrhage which had started with a definite history of trauma eight hours before admission to the hospital. Because of the rarity of this condition 27,703 consecutive cases were used as the basis for estimating the incidence of concealed hemorrhage. While premature separation of the normally situated placenta was found to occur 141 times or once to 196 cases, there were only 11 cases that showed more than a simple marginal separation, and only 3 cases of concealed hemorrhage in 27,703 consecutive cases; giving an incidence of one in 9,234 cases. The mortality in these 3 cases was 33.3 per cent. Because the incidence of occurrence in the controls is so slight and because the number of consecutive cases for each concealed hemorrhage is so much greater than the total number of the double uteri series it seems hardly fair to compare the two groups.

TABLE XIII. SERIES AND CONTROLS COMPARED AS TO MATERNAL MORTALITY AND MORBIDITY

COMPARISON	SERIES			CONTROLS		
	NO.	NO. CASES	PER CENT	NO.	NO. CASES	PER CENT
Maternal mortality	1	35	2.8	21	5,000	0.42
Death from concealed hemorrhage	1	1	100.0	1	3*	33.3
Maternal morbidity	12	39	30.7	248	5,000	0.7
Intrauterine manipulation†	39	39	100.0	398	5,061	7.9
Uterine packing‡	6	29	20.7	34	4,773	0.7
Cesarean section morbidity	3	5	60.0	22	139	15.8
Abortion morbidity	1	5	20.0	15	149	10.0
Morbidity of operative delivery per vaginam§	5	6	83.3	58	544	10.6
Morbidity of nonoperative deliveries§§	3	25	12.0	153	4,053	3.7
Morbidity of cases with intrauterine manipulation	12	39	30.7	61	398	15.3

*3 Cases of concealed hemorrhage in 27,703 cases or 1 to 9,234 cases.

†Including cesarean sections and abortions.

‡Excluding cesarean sections and abortions.

§Breeches and abortions not considered as operative deliveries.

§§Breeches included.

The maternal morbidity is higher in every respect studied than in the controls. This is probably explained by the fact that all the double uteri cases had intrauterine examinations and 20 per cent had packing. The incidence of morbidity increased markedly in the control group cases that had intranuterine manipulations.

Comparison as to Fetal Mortality.—The series showed proportionally fewer viable babies, many more abortions, and a higher percentage of

stillbirths than the control group, also an increase of monsters, especially hydrocephalic monsters. Even excluding the two stillbirths, both hydrocephalic monsters, and the two infant deaths due to prematurity, we still have, with the one death resulting from an obstetric injury, a mortality of 2.8 per cent. This is higher than that of the controls, which includes infant deaths from all causes. The percentage of stillbirths in vertex presentation in the double uteri group is about double that of the control group, but for breech presentation, the series stillbirth percentage is practically one-fourth that of the control group, though excluding macerates and neonatal deaths, the breech stillbirth incidence for the control group was about 12 per cent. This suggests an easy breech delivery in patients with double uteri, probably due to the tendency to prematurity. The fetal mortality is about three times as great in the double uteri series as in the controls.

TABLE XIV. FETAL MORTALITY COMPARED IN SERIES AND CONTROLS

CLASSIFICATIONS	SERIES		CONTROLS	
	NUMBER	PER CENT	NUMBER	PER CENT
Total pregnancies	39	100.0	5,061	100.0
Viable babies	34	87.1	4,912	97.0
Abortions	5	12.8	149	2.9
Stillbirths exclusive of abortions	2	5.1	188	3.6
1. Craniotomy on hydrocephalic breech				
2. Cesarean section on hydrocephalic				
Infant deaths (first 10 days)	3	7.6	99	1.9
1. Prematurity (breech, 6½ months)				
2. Prematurity (vertex, 7 months)				
after 1 day				
3. Vertex, cranial hemorrhage after 2				
days. High forceps				
Vertex, stillbirth	1	7.6	153	3.2
	(13 cases)		(4,736* cases)	
Breech, obstetric stillbirth	1	4.87	30	17.0†
	(21 cases)		(176* cases)	
Fetal mortality (excluding abortions)	5	14.2†	282	5.8†
Total mortality (including abortions)	10	25.6	431	8.5
Monsters	2	5.1	24	0.47
Hydrocephalic monsters	2	5.1	4	0.007

*Including prematures.

†Percentage taken of viable babies.

‡Including macerates and neonatal deaths.

Treatment of Deformity.—If one considers that in this series 74.2 per cent of the patients required and received no treatment for the deformity, that 17.1 per cent had simply a resection of the vaginal septum and that only 8.5 per cent had corrective operative procedures with somewhat questionable results, the prevailing opinion of most authorities, namely, that radical procedures for correction of the deformity should be indulged in when the deformity is discovered, seems to be grossly exaggerated.

Three patients were operated upon for other than simple resection of the vaginal septum. The first patient had an attempted elimination of the septum and bicornate character of the uterus by anterior vaginal hysterotomy and plastic at the time of curettage for inevitable abortion. The operation was difficult, the records lead one to suspect it was not satisfactorily completed and there is no available record of a later successful pregnancy.

The second patient (previously reported [30]) had a septum extending to, but not adherent to the fundus. The baby was delivered by breech extraction from the left side and the placental site was on the right side. The placenta was delivered by Credé and the cord was found to be held by the uterine septum. The cord was cut at one side within the vagina and traction exerted in the other portion of the cord. The septum was severed but the cut edges not sutured. The uterus was packed with iodoform gauze. A septum of the vagina had been resected at a previous breech delivery. No record of a later pregnancy is available.

The third case did seem benefited by her operative procedures for after 2 nonviable premature labors, each a breech presentation, at the second of which the vaginal septum was resected and later an abdominal hysterotomy with resection of the uterine septum was performed, this patient was delivered spontaneously of a seven months', 1880 gm. baby, presenting by vertex after labor had been induced by violent trauma. The fact that this baby died after one day and that the mother, having contracted gonorrhea resulting in pyosalpinx and later requiring abdominal salpingectomy, has had to my knowledge no further pregnancies, does not affect the evidence that after the operation she gave birth to a viable and normally presented baby.

TABLE XV. TREATMENT OF DEFORMITY

CLASSIFICATION OF TREATMENT OF DEFORMITY	NO.	PER CENT
Total number of mothers	35	100.0
No treatment for deformity	26	74.2
Simple resection of vaginal septum	6	17.1
Attempted elimination of horn by vaginal anterior hysterotomy	1	8.5
Resection of uterine septum and packing	1	
Resection of vaginal septum at delivery. Abdominal hysterotomy and resection of uterine septum at later date	1	

Previous Operation.—Four patients reported previous operations; one a resection of a vaginal septum at a previous delivery, the other three laparotomies, one of which was for the removal of an ovarian cyst, the others exploratory on the mistaken diagnosis of ectopic pregnancy.

TABLE XVI. CLASSIFICATION OF PREVIOUS OPERATIONS

TYPE OF OPERATION	NUMBER OF CASES
Total	4
1. Removal of ovarian cyst at four months. Para 2. Bicornis uterus with 1 miscarriage. Later had transverse. Later 1 vertex.	
2. Exploratory celiotomy for ectopic sixteen years before pregnancy. Nothing done. Para 1. Forty-five years. Breech.	
3. Removal of septum of vagina at previous delivery. Para 6 with 4 miscarriages and 1 normal vertex. Simple uterus bicornis unicollis at breech delivery.	
4. Exploratory celiotomy for ectopic at five months. Nothing done. Para 3 with 2 miscarriages.	

CONCLUSIONS

1. Double uterus of some type, exclusive of simple septate vagina and uterus arcuatus, was found about once in each 1,500 pregnancies in this series of cases. No case of rupture of the pregnant horn of a double uterus was found.

2. Foreign-born patients show a greater tendency than American-born.

3. Patients with double uteri show less tendency to become pregnant, but once having become pregnant, the incidence is equal.

4. There is an increased tendency to abortion, especially in types showing breech and transverse presentation.

5. There is greater liability to premature labor.

6. The right side is occupied more frequently than the left, though in patients with more than one pregnancy, alternate sides may be occupied. Twins may occupy both sides. The position of the presenting part is likely to be as the side occupied.

7. The placental site is more often right than left. There is marked increase in the necessity for manual removal of the placenta, but the popular opinion of the great tendency to postpartum hemorrhage has apparently been greatly exaggerated.

8. There is greatly increased frequency of breech and transverse presentations.

9. The average duration of labor is greater for primiparae but about equal for multiparae. The frequency of dry labor may explain the prolonged duration.

10. The tendency to contracted pelvis results in an increased incidence of cesarean sections. Greater number of breech presentations gives an increased operative incidence, if breech extraction is regarded as an operative delivery. Excluding these two forms of delivery there was no increased operative incidence.

11. Maternal mortality is comparatively high.
12. Increased maternal morbidity is to be expected, probably because of the maneuvers required for diagnosis of the condition and for delivery, rather than because of the condition per se.
13. There is a higher rate of fetal and infant mortality, abortions and stillbirths, a lower percentage of viable babies and an increased tendency to hydrocephalic monsters.
14. The necessity for operative correction has been greatly exaggerated.
15. A double uterus may be mistaken for an ectopic gestation, whether or not the patient is pregnant.
16. Patients with double uteri may have other gynecologic conditions requiring operation during or before gestation.

REFERENCES

- (1) *Klopowitz, A. K.*: Am. J. Surg. 6: 75, 1929. (2) *Weise, J. R.*: Am. Practitioner 27: 129, 1883. (3) *Lane, E. W.*: Atlanta Med. & Surg. J. p. 275, 1885. (4) *Wells, B. H.*: Am. J. Obst. 41: 317, 1900. (5) *DeLee, J. B.*: Principles and Practice of Obstetrics, Philadelphia, W. B. Saunders Co. (6) *Falls, F. H.*: AM. J. OBST. & GYNEC. 15: 399, 1928. (7) *Danreuther, W. T.*: AM. J. OBST. & GYNEC. 14: 376, 1927. (8) *Munde, P. I.*: Am. J. Obst. 23: 23, 1890. (9) *Trusdale, P. E.*: N. E. J. Med. 200: 1031, 1929. (10) *Brodhead, D. L.*: J. A. M. A. 74: 1453, 1920. (11) *Humpstone, O. P.*: AM. J. OBST. & GYNEC. 80: 229, 1919. (12) *Guizza, T.*: Riv. d. obst. et gynec. prat. 9: 157, 1927. (13) *Webster, T. C.*: Am. J. Obst. 49: 809, 1904. (14) *Quain, E. P.*: Surg. Gynec. Obst. 17: 427, 1913. (15) *Fanzandt, T. K.*: Kentucky Med. J. 26: 195, 1928. (16) *Argonz, E.*: Bol. Soc. de obst. y. ginec. 7: 450, 1928. (17) *Humpstone, O. P.*: Surg. Gynec. Obst. 31: 501, 1920. (18) *Wardlow, G., and Smith, W. P.*: Surg. Gynec. Obst. 35: 497, 1922. (19) *Scott and Forman*: Am. J. Obst. 73: 470, 1916. (20) *Jung*: Bull. Soc. d'obst. et de gynéc. 16: 682, 1927. (21) *Chapin, Warren B.*: N. Y. Med. J. 52: 352, 1890. (22) *Epstein, H. J., and Goldberg, S. A.*: AM. J. OBST. & GYNEC. 18: 342, 1927. (23) *Graves, W. P.*: Gynecology, 1919, W. B. Saunders Co. (24) *Moench, G. L.*: AM. J. OBST. & GYNEC. 13: 60, 1927. (25) *Williams, J. W.*: Obstetrics, ed. 4, p. 304, Appleton & Co. (26) *Jellinghaus, C. F.*: Bull. Lying-In Hosp. N. Y. C. 5: No. 1, 1908. (27) *Rosensohn, M.*: Bull. Lying-In Hosp. 13: 167, 1927. (28) Annual Report of The Society of the Lying-In Hospital, 1905, 1910, 1915, 1924-25, 1926, 1927, 1928, 1929. (29) *Smith, F. R.*: AM. J. OBST. & GYNEC. 21: 18, 1931. (30) *Smith, F. R.*: Bull. N. Y. Lying-In Hosp. 8: August, 1928. (31) *Kussmaul, Von dem Mangel*: Der Verkümmernng und Verdoppelung der Gebärmutter, Würzburg, 1859. (32) *Boni, A.*: La Clinica Obst. 3: 369, 1901. (33) *Puddicombe, J. F.*: Surg. Gynec. Obst. 49: 799, 1929.

107 EAST SIXTY-SEVENTH STREET.

(For discussion, see page 798.)

ABORTION IN RELATION TO FETAL AND MATERNAL WELFARE*

BY FRED J. TAUSSIG, M.D., ST. LOUIS, MO.

ANALYSIS

I. *Introduction:*

- (1) Definition of abortion.
- (2) Importance in vital statistics.
- (3) Statistical difficulties.

II. *Frequency of Abortion:*

- (1) General statistics.
- (2) Relation to population.
- (3) Relation to confinements.
- (4) Relation to marriage.
- (5) Relation to multiparity and age.
- (6) Relation to duration of pregnancy.
- (7) Relation to urban and rural groups.

III. *Cause and Prevention of Abortion:*

- (1) Spontaneous (trauma, infection, syphilis).
- (2) Induced (economic factors, feminist movement, decrease in infant mortality).
 - (a) Legislation.
 - (b) Birth control.
 - (c) Education.

IV. *Maternal Mortality of Abortion:*

A. Statistics:

- (1) Absolute figures.
- (2) Relation to puerperal mortality.
- (3) Relation to manner of abortion.
- (4) Relation to race.

B. Cause of Maternal Deaths:

- (1) Spontaneous and therapeutic cases (lack of asepsis and proper training of physicians, ignorance of patients, lack of hospital facilities).
- (2) Induced cases (under-cover conditions, fear of exposure, type of abortionist).

C. Ways of Reducing Maternal Mortality:

- (1) Better training of physicians.
- (2) Research on treatment of infection.
- (3) The Russian experiment.

V. *Maternal Morbidity After Abortion:*

- (1) Chronic invalidism.
- (2) Sterility.
- (3) Subsequent labors.
- (4) Psychic effects.

VI. *Summary.*

*Prepared for the White House Conference, Committee on Prenatal and Maternal Care, Subcommittee on Factors and Causes of Fetal, Early Infant and Maternal Morbidity and Mortality, Hugo Ehrenfest, M.D., St. Louis, Chairman.

I. INTRODUCTION

The term abortion as used in this paper, will denote the pre-viable expulsion of the human ovum. It will include all cases from the earliest conceptions to the twenty-eighth week of fetal life, regardless of the factors that may have led to the interruption of pregnancy. I have avoided the term "miscarriage," or any attempt to distinguish between early and late cases.

The significance of the abortion problem to our race can best be realized when we stop to figure that out of 1,000,000 human beings that are conceived, between 300,000 and 400,000 perish in the first six months of their intrauterine existence by abortion, that about 100,000 more die from that time to the completion of the first year of life, and that the remainder perish in various smaller amounts through the eight or nine decades of human existence. It may be claimed, to be sure, that the minute embryo in its first few weeks of development is not to be put in the balance against a fully developed adult human being; but the tremendous numbers of the former certainly make the problem a very real one. The sword of abortion, however, is double-edged in its destructiveness. It kills not only the impregnated ovum within the womb, but often takes as well the life of the young mother. It is appalling to note that in the childbearing years from fifteen to forty-five, in that epoch when mothers are most needed for the care of their young children, this scourge of abortion is responsible for deaths almost equaling those from childbirth. Heynemann has found abortion and its sequelae the most common cause for hospitalization in the gynecologic wards. It is this combination of a maternal with a fetal mortality that makes it of special significance.

Accurate statistical information on the subject of abortion encounters innumerable obstacles. This is due not merely to the fact that in the early abortions there is considerable diagnostic difficulty, but more especially to the efforts of the patients to conceal the truth, for fear of scandal or criminal prosecution. We find therefore that even in Germany with its accurate health statistics there is the greatest variance in the estimates as to the number of abortions. Some give the figures as 300,000, others as over a million annually. All attempts to register abortions as we do births has met with failure. Only a small percentage of them are so recorded. Only in Russia, where abortions are legalized, can we expect to find any appreciable percentage of cases recorded. And these Russian figures are of course only to a limited degree applicable to American conditions. In the city of Magdeburg, Germany, the Department of Health has made a most comprehensive special survey of all abortions for the period from 1924 to 1927. This report dealt not merely with the cases treated in clinics and hospitals. In fact they found that *only one-third* of all abortions in Magdeburg were thus treated, so that any data concerned

merely with hospital cases would have given a wrong impression. Reports from the German Krankenkassen (health insurance societies) throw an interesting light on the extent to which subterfuge by patients and doctors may conceal true figures. Among 100,000 women members of the Leipzig and Berlin health insurance societies, the reports indicated a striking difference in the number of women claiming incapacity for abortion and puerperal hemorrhage:

Leipzig, 642 abortions; 425 hemorrhages

Berlin, 2,418 abortions; 15 hemorrhages

The large number in Leipzig who claimed hemorrhage as a cause of disability clearly indicated that in that city numerous abortions had been classified under that head in order to conceal the truth. Physicians are inclined to gloss over the truth, since a statement of the true facts may involve serious consequences for their patients. Since fear of exposure plays so important a part in concealing the truth regarding abortion, more accurate data are usually obtainable by a careful history of the past pregnancies of the patient rather than by an enumeration of the abortions at the time of occurrence. If a year or two has elapsed since the abortion, the patient, especially if she is married, will not hesitate to tell the truth. I have frequently had patients tell me, without any persuasion, that they had as many as seven or more induced abortions. In what is to be said subsequently I trust the reader will appreciate all these difficulties and realize that I have tried to hit as close to the true mark as conditions permit.

II. FREQUENCY OF ABORTION

General Statistics.—The best statistical evidence on the subject of abortion in the United States has come from the investigations of the Children's Bureau of the United States Department of Labor, which analyzed 7,380 maternal deaths in 15 states occurring in 1927-28. This report will be considered subsequently under the head of maternal mortality. Dr. Frances C. Rothert, who analyzed these figures, stated in a communication to me that the department had absolutely no data on the frequency of abortions in this country. Hospital and dispensary figures are of course entirely inadequate in giving an idea of the frequency of this condition. It might be of interest to note that in such institutions in the city of New York, the Department of Health recorded 1,350 cases in 1926, 1,783 cases in 1927, 2,380 cases in 1928, 2,568 cases in 1929, and 2,313 cases in 1930. This included only illegal operations and not the spontaneous abortions. Dr. S. Dana Hubbard, from whom these figures were obtained, writes me that in the opinion of an eminent gynecologist in New York approximately 100,000 abortions occurred annually in that city. I was however unable to obtain any positive evidence of a marked increase in

the abortion rate during the past fifteen years corresponding to that which has apparently taken place in some of the European countries. Doubtless the more stable social and economic conditions present in this country have been a determining factor. The rapid growth, however, of our urban districts as against the rural districts must have produced some increase in the abortion ratio, since the figures throughout the world concur in the greater incidence of abortion in cities as against country districts. If we try then roughly to estimate the total number of abortions that occur annually in this country we can, I believe, justly assume a minimum ratio of one abortion to two and one-half confinements* in the cities and a ratio of 1 abortion to 5 confinements* in the country districts. On the basis of 2,500,000 confinements annually in the United States, distributed 40 per cent in the cities and 60 per cent in the country districts, we obtain a total figure of approximately 700,000 abortions annually. This is certainly rather an underestimate than an overestimate of the actual condition.

Abortion may be divided in its etiology into three groups: (1) spontaneous, (2) therapeutic, and (3) criminally induced. Authorities both here and abroad agree that of the three types the most common is that of criminal abortion. The proportion as given in the Children's Bureau, maternal mortality statistics is 37 per cent spontaneous, 13 per cent therapeutic and 50 per cent criminal, out of a total of 1,587 maternal deaths in which the necessary data were available. In the larger cities the percentage of criminal abortions runs as high as 75 to 80 per cent. Heynemann, for 1922, gives the percentage of such abortions in Berlin as 89 per cent, Munich 66 per cent, and Hamburg 70 per cent. In the country districts this percentage is somewhat less. Plass in a questionnaire answered by 81 country practitioners in Iowa and surrounding states with a maternity experience of approximately 51,000 deliveries found that abortions were divided into 34.1 per cent spontaneous, 41½ per cent therapeutic, and 61.4 per cent criminal.

Relation to Population.—Ordinarily the ratio of abortion is given on a basis of the total population of a certain city or district. Roesle shows that these figures do not give a correct picture inasmuch as the influx of large numbers of young people to the cities brings about a greater percentage of women in the childbearing years in such communities. These figures are particularly valuable when we try to make comparison between two periods of time. Thus in the city of Magdeburg, Germany, where a careful survey was made in 1912 and again in 1927 the ratio of abortion based on the total population showed a decline that was not as great as when the figures were based upon the number of women between fifteen and forty-five years of

*See paragraph "Relation to Confinements" for data.

age. He calls this the pre-fertility ratio and Table I shows that there is a definite difference between the two methods of calculation.

TABLE I. PRE-FERTILITY RATIO OF ABORTION (MAGDEBURG)

YEAR	TOTAL POPULATION IN THOUSANDS	TOTAL OF ABORTIONS		NUMBER OF WOMEN BETWEEN 15 AND 45 YEARS IN THOUSANDS	RATIO OF ABOR- TIONS IN RELATION TO A THOUSAND SUCH WOMEN
		ABSOLUTE FIGURES	RATIO TO TOTAL POPULATION		
1912	288	1458	5.1	72	20.3
1927	298	1448	4.9	81	17.9

For the city of Berlin, Roesle calculates that the pre-fertility ratio was 31 per thousand in 1926 and 33 per thousand in 1927. When we compare the figures for Berlin in 1927 with those for Magdeburg we see that in that year the ratio was almost twice as large in Berlin. This corresponds with the general belief that induced abortions are particularly prevalent in the large metropolitan centers. From Russia we have accurate figures on the population of Leningrad, and in the year 1926 we find that 21,646 abortions were registered, a ratio of 44 per thousand women between fifteen and forty-five years of age. While these figures exceed those of Berlin, the difference may be an apparent rather than a real one, since doubtless large numbers of criminal abortions were not recorded in the Berlin calculations.

Engelsmann, in extensive statistics from the city of Kiel, contended that there is no decrease in the number of pregnancies but that the decrease in the birth rate is counterbalanced by the increase in abortions. Specially significant is the decrease in the number of children among fertile families and also the fact that while in the laboring classes the percentage of births is still the highest it also contains the highest percentage of abortions.

This influence of abortions upon the birth rate has been emphasized with some justice in Russian statistics. Dr. A. B. Genss, the official statistician on this subject, points out that while the birth rate in England dropped from 28.4 per thousand in 1910 to 16.7 per thousand in 1927 (a decrease of 41 per cent), while in Germany it has in the similar period dropped from 34.7 to 18.3 (a decrease of 47 per cent), and while all the other European countries showed a similar decline, the Russian birth rate had only declined from 47.2 per thousand in 1910 to 44 in 1927, thus remaining by far the highest for all Europe. He points out that legalization of abortion has not produced in Russia any material decline in the population rate. In illustration of this he compares the figures from Moscow in 1913 with those for 1926. In 1913 the birth rate was 32.3 per thousand while in 1926 it was 28.9 per thousand. On a basis of 2,019,453 population in 1926 a continuance of the birth rate of 1913 would have produced 66,000 children. In fact 58,384 children were born that year. There remains, therefore,

a deficit of 7,000 children or 3.4 per thousand. Now the index of abortions was 15.8 per thousand in 1926 in comparison with 2.9 per thousand in 1913. If we add the 2.9 per thousand of 1913 to the 3.4 per thousand which represents the true increase in abortions, we get 6.3 per thousand as against 15.8 actually observed. The difference between these two figures, amounting to 9.5 per thousand abortions, with some justice he interprets as the correct figures for the *secret unregistered* abortions. His claim, therefore, is that, instead of there being over five times as many abortions in 1926 as compared with 1913, the true increase with legalized abortion amounted to but 3.4 per thousand, approximately 30 per cent. Genss' figures are of course based on the assumption that there has been no increase in the percentage of conceptions, and if we consider the extensive birth control propaganda in Russia, we can I believe fairly assume that, even in spite of laxer moral conditions, there has been no increase in the ratio of conceptions.

Relation to Confinements.—Williams in his Textbook states that the ratio of abortions to confinements is 1 to 4 or 5. Others have given a similar rather low ratio of abortions to confinements. I do not feel however, as already stated, that these figures based largely upon material coming to dispensaries and hospitals are a true index. In 1910, I made a tabulation of 600 women coming to the Washington University Dispensary in St. Louis for treatment in the gynecologic and medical clinics. These women gave a record of 870 full-term confinements as compared to 371 abortions, a ratio of one abortion to 2.3 confinements. The figures obtained by Macomber in Boston from the records of 250 married women showed 128 abortions to 440 confinements, a ratio of 1 to 3.4. He also found that in patients with a lowered fertility, a group of 250 such women showed 85 abortions to 183 pregnancies, a ratio of 1 to 2.1. In England, Whitehouse of Birmingham gives the ratio of abortions to pregnancies as 1 to 5.9. More complete data are available from Germany where the ratio given by Schottelius in Hamburg for 1919 was 8,707 abortions to 16,779 confinements, or a ratio of 1 to 2. Heynemann is convinced that the ratio of abortions to confinements has steadily increased until at the present time the number of abortions equals those of full-term confinements. Latzko in Vienna has found a similar marked increase in the percentage of abortions as shown in Table II.

TABLE II. RATIO OF CONFINEMENTS TO ABORTIONS (VIENNA)

YEAR	CONFINEMENTS	ABORTIONS	PER CENT OF ABORTIONS
1898	1148	218	18.9
1908	1894	613	32.7
1913	3611	2,068	57.2

From Poland the figures are not quite so high. In the town of Warsaw there were in 1921, 3,403 confinements and 1,138 abortions, a proportion of 3 to 1. France, that has always had a very low birth rate, is reported by Balthazard, Lacassagne and Deleris to have an average of 500,000 to 600,000 abortions every year, making a proportion of practically 1 abortion to 1 confinement. According to Mme. Lebedeva, the average in the small towns of Russia is about 1 abortion to 4 confinements but in the large cities such as Moscow it is 70 abortions to 100 confinements and in Leningrad, in 1928, there were recorded 38,500 confinements at term and 53,000 registered abortions or a ratio of 1 abortion to 0.7 confinements.

Relation to Marriage.—The increase in the number of abortions which has been generally observed throughout the world has been due less to a laxity of morals than to underlying economic conditions. This is seen by the fact that the considerable majority of even the criminal abortions occur in married rather than unmarried women. Among younger individuals, however, this is not the case. Thus Ofderdinger in Hamburg found that the percentage of illegitimacy among women under twenty years of age was 63 per cent; between twenty and twenty-five years, 40 per cent; between twenty-five and thirty years, 14.3 per cent; between thirty-one and thirty-five years, 3.5 per cent; and between thirty-six and forty years, 1.6 per cent. Riechelt found, in Breslau that abortions were more frequent among the unmarried, 1,179 of the patients being unmarried and 691 married. Dame Louise McIlroy in a report submitted July, 1929, states that in England criminal abortion before the war had been mainly resorted to by unmarried women but that at the present time it was most frequent among married women. In the United States, based on the maternal mortality statistics, of the 1,824 women who died following abortions 186 were unmarried whereas 1,638 women were married.

Relation to Age and Multiparity.—The reports from the maternal mortality figures of the Bureau of Child Welfare show that abortion preceded the death of 409 primiparae, equivalent to 18 per cent of the 2,334 known primiparae whose deaths were included in the study, and that 1,170 multiparae or 26 per cent of the 4,519 known multiparae died following abortion. In Russia, where legalized induced abortion is discouraged among primiparae, Genss has found that only 3.2 per cent occur below twenty years of age. In the larger towns the majority were in women between twenty and thirty years of age with one or two children, and in the country districts the period of greatest frequency of abortion was in women between thirty and forty years of age with three or four children. Somewhat in contrast to these figures are those given by Kardobovsky who found that among 2,656 legal abortions in Lugansk the average number of living children was only 1.7. Roesle in his careful statistical study from Magde-

burg gives us the following interesting table showing the relation of legitimate and illegitimate abortions to the number of pregnancies.

TABLE III A. DISTRIBUTION OF LEGITIMATE ABORTIONS TO PREGNANCIES

TIME & PLACE	NO. OF ABORTIONS	POSITION OF THIS ABORTION TO PREVIOUS PREGNANCIES PER THOUSAND ABORTIONS			
		GRAVIDA 1	GRAVIDA 2	GRAVIDA 3	4 OR MORE
Magdeburg 1925-1927	3359	9.0	22.0	25.4	43.6
Halle a.s. 1919-1923	3015	11.8	22.7	20.7	44.8
Lubeck 1925-1926	606	6.9	21.1	27.6	44.4
Leningrad 1925	9976	4.2	17.4	19.8	58.6

TABLE III B. DISTRIBUTION OF ILLEGITIMATE ABORTIONS TO PREGNANCIES

TIME & PLACE	NO. OF ABORTIONS	POSITION OF THIS ABORTION TO PREVIOUS PREGNANCIES PER THOUSAND ABORTIONS			
		GRAVIDA 1	GRAVIDA 2	GRAVIDA 3	4 OR MORE
Magdeburg 1925-1927	1559	65.2	22.9	8.0	3.9
Halle a.s. 1919-1923	892	74.0	17.3	5.1	3.6
Lubeck 1925-1926	220	74.1	15.5	4.5	5.9
Leningrad 1925	3162	29.0	24.6	16.3	30.1

From these tables it would appear that legitimate abortions occur much more frequently among multigravidae, whereas among the illegitimate abortions in the smaller German cities about three-fourths occur in primiparae. Russia alone shows over 70 per cent of legal abortions among multigravidae. We have also a very interesting tabulation given by Genss showing the distribution of abortions and births to the age of the mothers in the city of Moscow in 1926.

TABLE IV. RELATION OF ABORTION TO AGE OF MOTHERS (MOSCOW)

AGE	NO. OF WOMEN	ALL BIRTHS	ABORTIONS	PER THOUSAND WOMEN			PER CENT OF ABORTIONS TO TOTAL PREGNANCIES
				BIRTHS	ABORT.	CONCEP.	
15-19	102,809	2,593	1,151	25.2	11.2	36.4	30.8
20-29	212,314	39,611	20,216	145.4	74.3	219.7	30.8
30-39	182,675	14,622	9,436	80.0	51.7	131.7	39.2
40-49	104,992	1,568	1,183	13.9	12.2	26.1	46.3
Totals	602,790	58,384	31,986				35.3

Relation to Duration of Pregnancy.—Since abortion increases in its dangers as the pregnancy advances and since spontaneous abortion is more frequent in the second and third month owing to the fact that the ovum is not yet so firmly attached to the uterus, it is not surprising that the incidence of all abortions is very much greater during

these two months. This difference has been emphasized in Russia by the refusal of the government to tolerate the induction of abortion after the third month except under very rare conditions. Genss gives the following interesting figures.

TABLE V. RATIO OF ABORTION TO PERIOD OF GESTATION (RUSSIA)

	FIRST MONTH PER CENT	SECOND MONTH PER CENT	THIRD MONTH PER CENT	FOURTH MONTH PER CENT	AFTER FOURTH PER CENT
1912					
Secret illegal	0.45	41.5	33.0	14.3	10.4
1926					
Illegal	1.1	57.1	28.9	8.1	4.8
1926					
Legal	1.3	86.2	12.0	0.3	0.2

In Roesle's statistics from Magdeburg there was no appreciable difference between the spontaneous and criminal abortions. They are given as 0.4 per cent in the first month; 8.2 per cent second month, 33.6 per cent third month, 31.4 per cent fourth month, 15.9 per cent fifth month, and 7.2 per cent sixth month.

Relation to Urban and Rural Groups.—The striking difference in the abortion rates between large cities, towns, and country districts has already been touched upon. In the United States as far as our information goes there is a definite increase in the number of abortions in the large metropolitan centers, whereas at least the one report by Dr. Plass from rural districts in the midwest indicates that no noticeable increase has occurred in this area. These figures were obtained from 81 physicians, of whom 26 stated that there was an increase in abortions, and 55 stated that there was no such increase. Unfortunately the question was so worded that we cannot tell how many of the latter group believed that there had been a decrease. The proportion of abortions to confinements given by those 81 physicians averaged 18.3 per cent or approximately one abortion to five confinements. The ratio of spontaneous, therapeutic and criminal abortions has already been given. There seems to be a definite difference in the rural and urban groups as to the factors justifying the abortion. Genss found that in Russia illness was a much more common cause of legalized abortion in the country districts than in towns, 29.7 per cent compared with 19.3 per cent and that in the country districts the desire to conceal the pregnancy was far greater (7.3 per cent compared to 1.6 per cent in the cities). The figures given in the League of Nations report show that in the Soviet Union the registration of abortions is less complete in country districts and secret abortion far more common. In eight provinces of Russia the number of legalized abortions per 1,000 women showed this striking difference.

TABLE VI. RELATION OF ABORTION TO AGE IN URBAN AND RURAL DISTRICTS (RUSSIA)

		AVERAGE OF ABORTIONS PER 1000 WOMEN					
		UNDER, 17 YR.	FROM 18-19 YR.	FROM 20-29 YR.	FROM 30-39 YR.	FROM 40-49 YR.	TOTAL AV. 15-49 YR.
In eight provinces	Rural districts	0.11	1.16	4.73	5.54	1.84	3.38
	Urban districts	0.92	11.69	48.35	40.41	10.19	35.40

In Germany also, as indicated by the puerperal mortality figures, we find that the incidence of abortion as indicated by the abortion mortality had a ratio of 2.1 per 1,000 in the towns and 0.78 per 1,000 in the country districts.

(To be completed in the December issue.)

Knoche: The Formation of Stratified Epithelium in Castrated White Mice after Injection with Sea Water. *Zentralbl. f. Gynäk.* 54: 849, 1930.

Beginning with the observation that the natives of Chile assigned an aprodisiac power to a sea squirt, "Piure," the author, in a series of 15 well controlled experiments, injected extracts of this animal, and sea water, filtered, sterilized, or untreated, into castrated female mice. He found that all of these test solutions produced some epithelial cell formation in the mice in from twenty-four to thirty-six hours. The results were perhaps not as marked as are the results from folliculin, but were definite. Distilled water, tap water, and artificial sea water gave no result. Only when the artificial sea water had sodium iodide added to it did any of the test animals react to anything other than natural sea water, or extract of sea squirt.

WILLIAM F. MENGERT.

Bickenbach: Alkali Necrosis of the Uterus and the Adnexa after Injection of a Soap Solution into the Uterus. *Med. Klin.* 26: 1663, 1930.

The author reports the case of a woman who when three months pregnant had injected into her uterus a soap solution. Symptoms of peritonitis followed and a laparotomy was performed. At operation, in addition to peritonitis, it was found that all the pelvic organs were necrotic. The patient died soon after the operation. The soap solution which had been injected into the uterus, was forced through the tubes into the peritoneal cavity. All along its path hemorrhage and necrosis resulted. These pathologic changes were due not to the soap itself but to the alkali hydroxide which was in the soap mixture.

J. P. GREENHILL.

RECONSTRUCTION OF THE URETHRA AND VESICAL SPHINCTER BY EMPLOYING THE LEVATOR ANI MUSCLES*

BY MARION DOUGLASS, M.D., F.A.C.S., CLEVELAND, OHIO

(From the Department of Obstetrics and Gynecology, Western Reserve University School of Medicine and The Lakeside Hospital)

I WISH to present a method of operation used in 3 cases of urinary incontinence due to loss or destruction of the urethra and vesical sphincter. The levator muscles were employed in the construction of a vesical sphincter mechanism producing a satisfactory anatomical and functional result. Several years ago Dr. W. H. McGaw and I reported a successful case in which we attempted to reconstruct the urethra and vesical sphincter by making a loop of pieces of levator muscle, and encircling the urethra previously elongated by a flap transplantation performed previously. Since that time we have operated upon two similar cases by the same method with success. The repair or replacement of the urethra and the creation of a functioning sphincter mechanism is often most difficult but the cure of urinary incontinence is well worth almost any effort. No patient, perhaps, is more grateful for relief than the victim of urinary leakage.

Lamballe in 1849 discussed the causes and treatment of defects in the urethra. Baker Brown (1863) made a urethra by producing a punctured wound with a trocar below the clitoris into the bladder. Into this opening he placed a silver catheter and eventually, after healing, the patient was continent. This was the first cure. Lawson Tait (1878) made the first antoplastie repair of defects of the urethra followed by Schroeder and later, Freund (1880) and Pozzi (1888). Kelly elaborated the idea of the tunnel in the mucosa of the anterior vaginal wall. He dissected an elongated tongue of mucosa from behind the fistula and pulled it forward over the fistulous opening, making a tunnel and a new urinary canal. The anterior half was epithelialized. In most of the early procedures, an abnormally long urethra, detached from the bladder, has been made at the first step, and which was joined to the vesical neck at the second sitting with no attempt to produce a cut-off valve with varying tone.

When continence was obtained, it was probably due to the extraordinary length of the new urethra with a kink or some incidental narrowing of its lumen which offered a barrier to the escape of urine. Noble, Sellheim, Péan, and others successfully reconstructed the urethra by transplantation of flaps. They employed the labia and vaginal wall while Rosser and Richards employed free transplantation of the fallopian tube and vermiform appendix and secured functioning urethras. The construction of an effective artificial sphincter is rather difficult. There have been various muscle transplantation operations attempted. Recently Deming transplanted a strip of gracilis muscle and brought the urethra through a loop made like

*Read at the Forty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931.

a raquet at the end of the muscle, which supplied the urinary canal with a support which had sufficient tonus to prevent leakage of urine.

Taussig (1918) employed a unilateral transplantation of the levator muscle for incontinence with a partially successful result and recommended the employment of a muscle flap from both levators crossed under the urethra. Originally when this operation was done by us, we were unaware that the levator ani muscle had been previously employed in women in the attempt to make a sphincter. Ruebsam and Brjosowsky employed the pyramidalis and levator ani muscles successfully in men in 1923. There have been numerous procedures reported by French and German surgeons since we reported our first case by this technic. Imbert in 1924 reported an attempt to reverse pieces of levator ani muscle crossing over the anterior vaginal

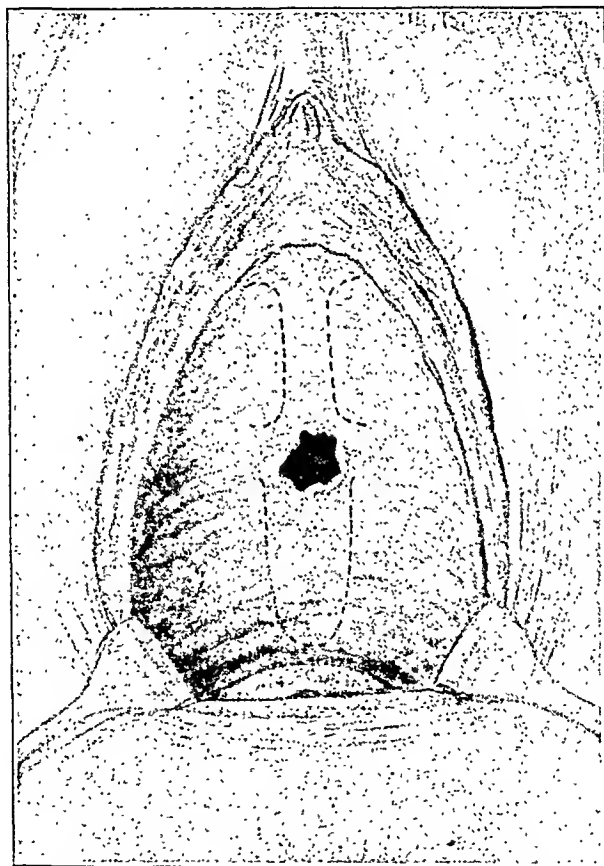


Fig. 1.—The fistulous opening in the anterior vaginal wall. Outline of the denudation.

wall under the urethra to make a bulwark but making no attempt to surround the urethra with any form of circular sphincter mechanism. Marion employed a free graft of vaginal mucosa made into a tube and carried in through a cystotomy wound, so as to lie in a trocar coming from the bladder to the exterior under the symphysis. Markoff employed a technic somewhat like a Witzel operation on the stomach, pulling out a long neck of bladder with a sharp kink above the urethral orifice. Other structures, such as strips of fascia from the rectus (H. Hans), have been placed beneath the urethra in loops. Martius in 1929 constructed a tube of vaginal mucosa as a urethra and placed across it a strip of bulbo- and ischio-cavernosus muscle at its base, reporting a perfectly satisfactory functional result.

It would seem, from the diversity of methods, claimed in various hands to be satisfactory, that either the condition is extremely easy to cure and that a cut-off mechanism which is functionally satisfactory can be made by almost any method, or that the cure of vesical sphincter defects is extremely difficult and that there is no reasonably satisfactory method as yet described. Healing of almost any bladder defect with successful functional result may occur in any isolated instance regardless of the method employed. Having obtained a good

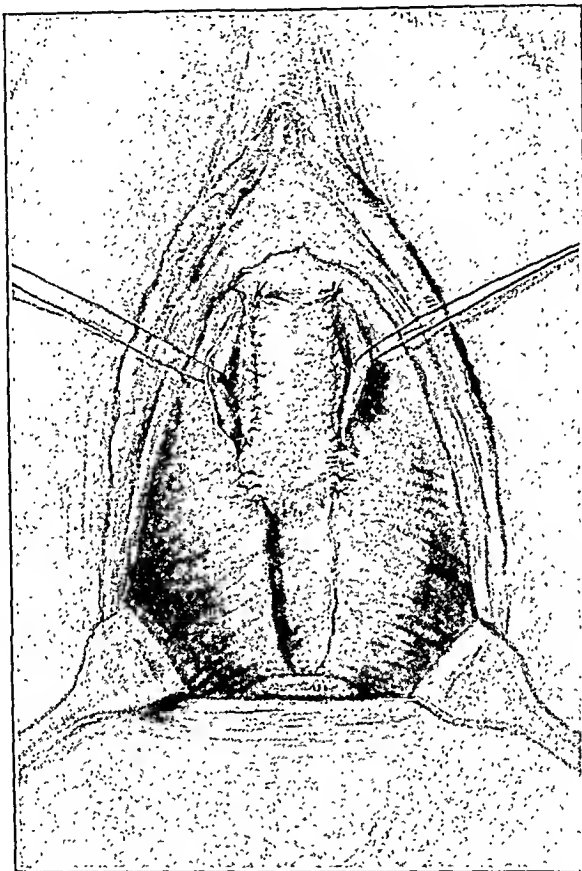


Fig. 2.—Mobilized strip of mucosa turned anteriorly and sutured to anterior flap covering fistula and producing a completely epithelialized tube.

result in 3 rather bad cases by a uniform technique, we felt that the method might merit consideration.

We attempted first a repair of the urethra so that there would be some urethra distal to the transplanted levators which were to act as the sphincter mechanism. In the final result, however, the increase in length of the urethra is more apparent than real because more than half of the transplanted flaps was lost by slough. In Case 2 however, where there was a gaping opening, the lower segment of mucosa was simply slid forward on the anterior segment and fastened with lateral

sutures, the mucosal edges being freshened. The second step was performed identically. It was necessary in Case 2 to place a few additional stitches laterally, to make the urethral orifice a trifle smaller.

The operation was done as follows:

The vesical neck is narrowed by fine sutures, plicating the vesical orifice which is superficially denuded. Incision is made along the lines indicated, mobilizing a flap of mucosa below the gaping fistulous opening, and incision of the mucosa is made above the defect as indicated in Fig. 1.

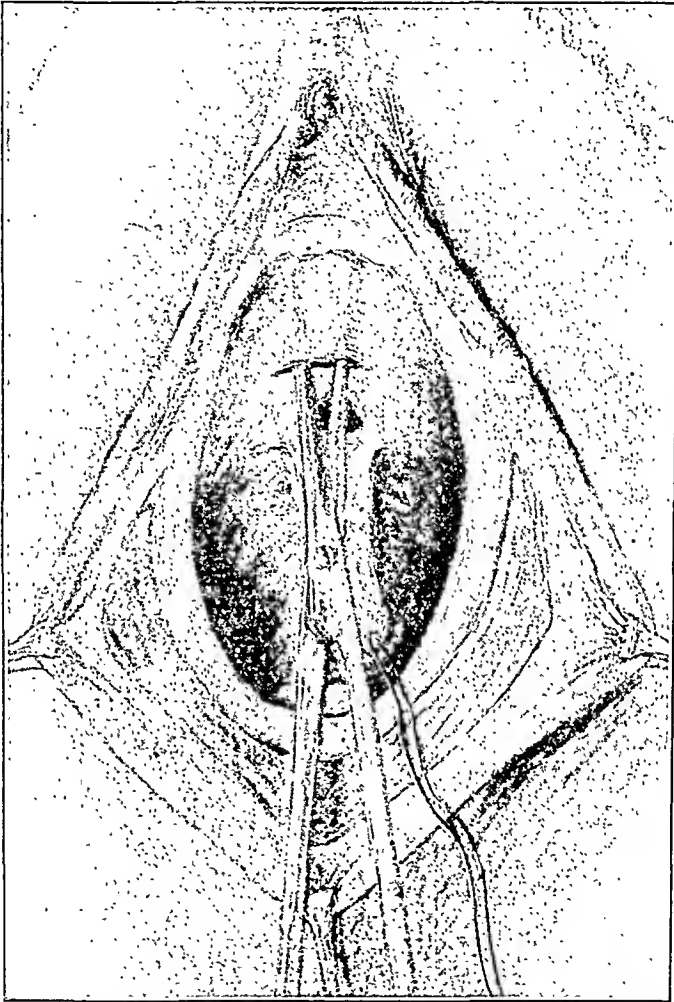


Fig. 3.—A flap is mobilized as before behind the opening of the urethra, and a tunnel dissected to a point *higher* than the normal urethral orifice.

This flap is turned and its lateral edges sutured with fine catgut sutures to the edges of the partially undercut flap above as in Fig. 2.

A small mushroom catheter is placed in the bladder and the vaginal mucosa is undercut sufficiently to permit suturing over a catheter placed in the new canal as in Fig. 3.

The catheter is removed after eleven or twelve days and the patient is discharged a few days later. These patients have to void every ten to twenty minutes

to prevent leakage. About two weeks later the patient is readmitted to the hospital. In the meantime some degree of continence has been attained if the bladder is emptied frequently. On examination it is found that the patient's urethra is approximately $\frac{1}{2}$ inch long, and the urethral orifice is higher upon the vaginal wall.

At the second operation, a flap of mucosa is dissected free posterior to the urethral orifice as in step 1 and a tunnel under the mucosa produced above the urethra as in Fig. 4.

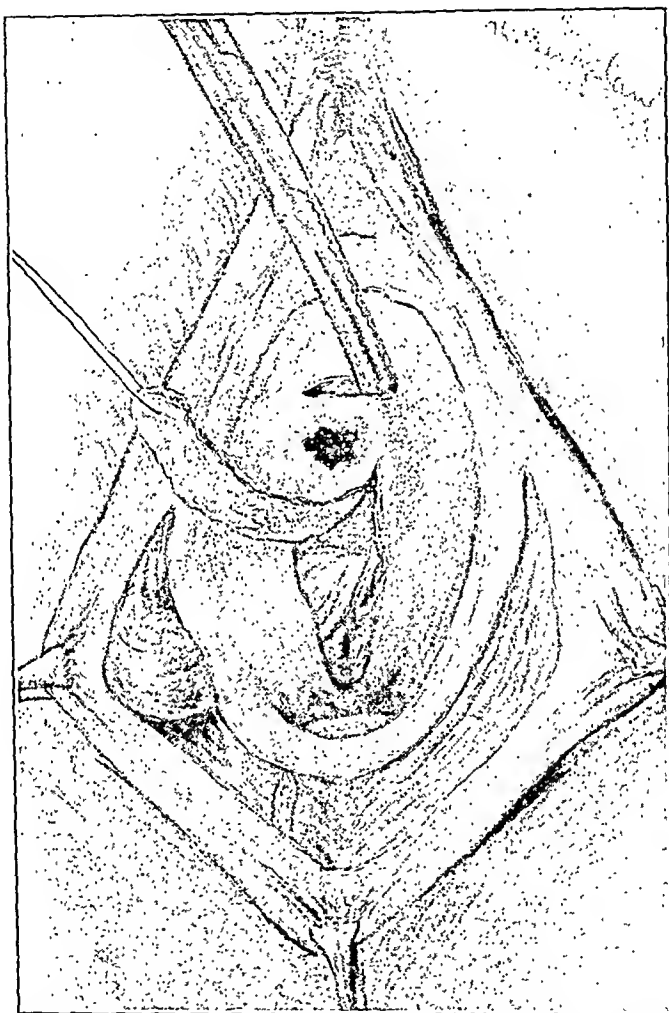


Fig. 4.—Perforation made across roof of vaginal canal to grasp opposite levator edge which has been exposed and cut off.

The perineum is denuded and strips of levator muscle are cut free and picked up by a Kelly clamp which is passed across the roof of the vagina under the mucosa. The freed flaps of muscle are pulled across the roof of the vagina and around the urethra as in Fig. 5, each flap passing to the opposite side.

This is a little difficult but with patience can be done without tearing the mucosa or producing bleeding. The crossed ends of the muscles are fastened together above and below the urethra with fine stiches as in Fig. 6.

This forms a complete ring of muscular tissue. A small mushroom catheter is

inserted at this point through the tunnel and through the muscular circle produced by the levator transplantation as in Fig. 7.

The flap of mucosa was pulled through the tunnel to form the anterior inner surface of the new urethra as in Fig. 8.

A few stitches are taken at the angles near the neck of the bladder to repair the two small lateral defects which is the weak spot in the urethral repair. This, however, is external to the new sphincter and is not so important. The denuded portion is closed with continuous chromic catgut sutures, and near the sphincter the

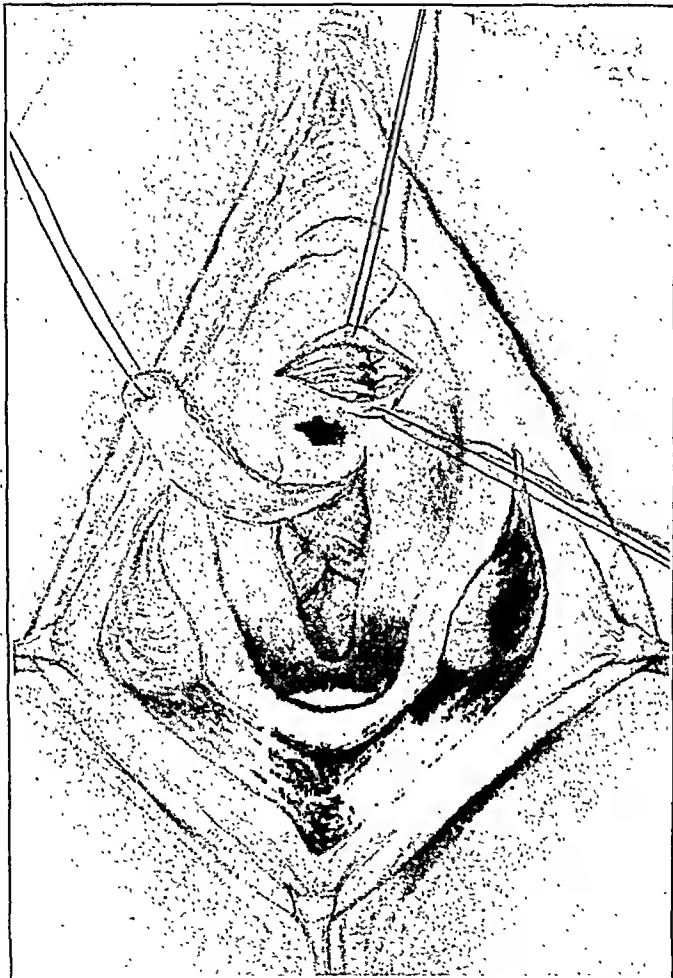


Fig. 5.—Suture of the levator muscle transplants around the end (i. e., at the present orifice) of the urethra, forming a circle of muscle preliminary to lengthening the urethra.

mucosa is dissected back laterally to permit its mobilization and it is everted by means of fine buried mattress sutures to form a small bulkhead over the lateral defects at the edges of the new urethra. The perineum is closed, approximating the levators as well as possible but taking care not to produce too much narrowing of the vaginal orifice. The vagina may be sutured transversely, so as not to produce vaginal atresia. The transplanted levator ani muscles can be felt lying in the upper lateral walls of the vagina. The vagina is definitely narrowed, the point of greatest narrowing being at the neck of the bladder about $1\frac{1}{2}$ inches from the outlet. The urinary stream is diverted into the new canal.

CASE REPORTS

CASE 1.—Mrs. R., colored, aged thirty, para 5. This patient had been partially incontinent since her last pregnancy five years ago and had marked frequency with complete incontinence for the last year. The baby had been large and there has been dystocia but no instrumental delivery. The Wassermann was negative. Pelvic examination revealed a relaxed vaginal outlet with cystocele and rectocele. The urethra had been torn away and the situation of the present urethral orifice was almost exactly at the neck of the bladder. The opening admitted a little finger

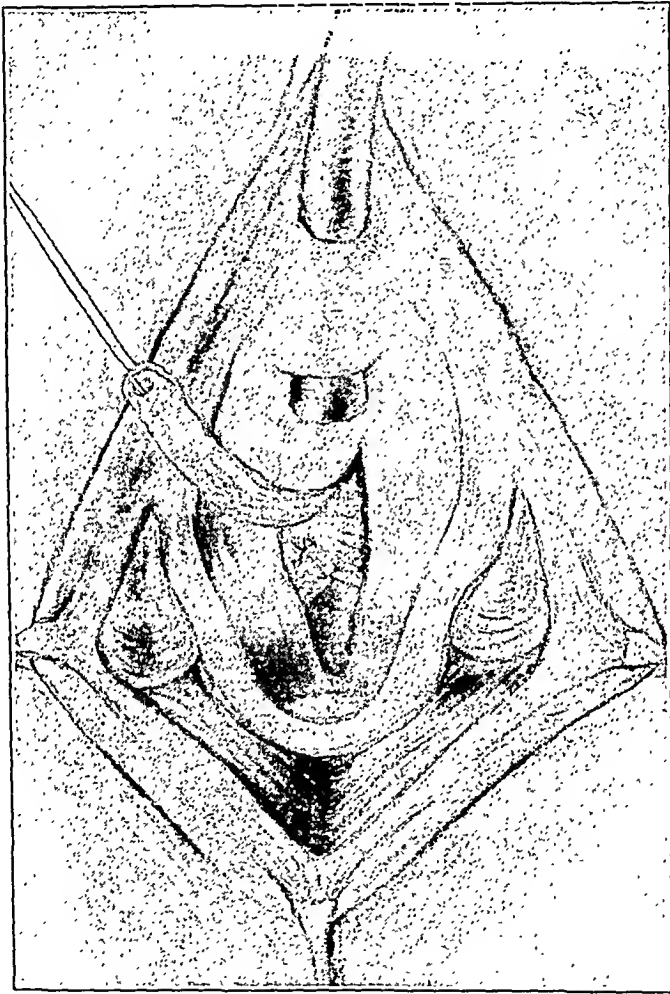


Fig. 6.—Insertion of retention catheter through the new sphincter.

which could be passed through the neck of the bladder. There was a polypoid ectropion of vesical mucosa in the form of a papillary growth which acted almost as a ball valve. The cervix was in good condition. The uterus was anterior, enlarged to three or four times its normal size by multiple myomas, one of which on the anterior surface encroached upon the bladder. The uterus was freely movable, and there were no lateral masses. It was decided merely to attempt the reconstruction of the urethra and bladder sphincter, and then perform hysterectomy and perineorrhaphy later. There was considerable scar tissue in the vaginal vault which made the denudation somewhat difficult. The above described procedure was carried out in two stages about one month apart.

Immediate convalescence was uncomplicated. The catheter was removed on the twelfth postoperative day and the patient was completely incontinent. She had a chill the following day, with headache, malaise and leucocytosis. The urine showed a few pus cells. The temperature returned to normal in three or four days. Careful investigation of the urine, pelvis, and lungs failed to reveal the source of the chill. The catheter was reinserted without difficulty and there was no leakage. The catheter was removed fifteen days later, and the patient had fair voluntary control of urination. Occasionally the urine escaped without her knowledge, but by emptying the bladder fairly frequently she was able to maintain a fair degree of

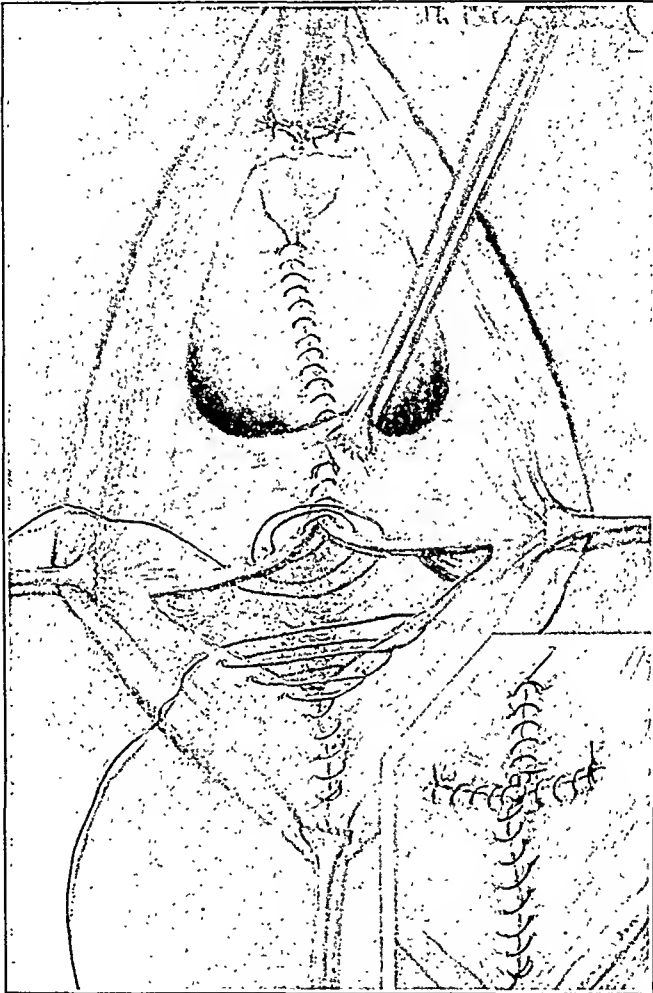


Fig. 7.—Suture of the submucosal fascia and vaginal mucosa is complete and the closure of the mucosa of the posterior vaginal wall is being completed in a T-shape to avoid tension.

continence at the time of her discharge from the hospital. This patient became completely continent of urine within a few weeks.

CASE 2.—C. G., colored, para 1, aged twenty-five. This patient came into the hospital complaining of frequency of urination. Her past and family histories were negative. Catamenia was normal. Pelvic examination was normal except for slight tenderness in the adnexal region. Projecting from the vaginal orifice was a red urethral caruncle about $1\frac{1}{2}$ cm. in diameter. This was removed by dissection and the patient was discharged relieved of urinary symptoms in about five days.

Three weeks later, on pelvic examination, it was seen that the urethra had been the seat of some destructive process and one could look directly into the bladder. The urine contained some albumin and a few pus cells. Biopsy from the neck of the bladder showed benign papillary epithelial overgrowth. A plastic was performed on the neck of the bladder. A mushroom catheter was placed in the bladder and this case was treated like the other one.

This patient returned to the hospital in a month completely incontinent. The urethra was about 1 to 2 cm. long. The second step was performed transplanting the levators. The patient was kept in the hospital a month and could retain urine without leakage for an hour. She was discharged continent providing the bladder was not overfilled. The patient has been six months under observation. I have twice narrowed the vesical orifice further by fine chromic sutures. This was done because the patient was incontinent only when the motion was made of rising from the chair. On her feet, walking, sitting, or lying down, her bladder is competent.

CASE 3.—G. P., colored. This patient is a multipara of forty-two years. Physical examination revealed a rectovaginal fistula and stricture of the rectum. This patient was a known syphilitic, inactive following intensive treatment. She complained of urinary incontinence. There was a granulating area about 3 cm. in diameter below the urethral orifice. The urethral orifice was dilated so that the tip of the finger could be inserted into the bladder. Investigation of this patient showed no sign of central nervous system syphilis although the patient was known to have a 4-plus Wassermann. Operation was performed upon this patient with good result. The stricture was dilated and the rectovaginal fistula closed. A preliminary colostomy was done. The above described operation was performed on the bladder after stricture was dilated and the rectovaginal fistula closed. The patient is in excellent health and spirits. She is continent within the limits of emptying her bladder every hour.

SUMMARY

These patients have been followed for periods ranging from six months to four years, and we find that they are completely continent except for the very occasional loss of a few drops of urine. They do not find it necessary to wear pads. Firm pressure in the midpoint of the vaginal floor opens the urethra permitting the escape of urine. The attachment of each sphincter end across under the urethra to the opposite side of the vaginal roof gives a constriction of the urethra by scissor-like mechanism of fibromuscular tissue. The method may be useful if any similar cases are encountered. We believe it would be advisable not to suture the perineal muscles too tightly following transplantation, as any pull on the perineal floor seems to pull down on the urethral floor which favors leakage. Two of our patients are able to produce visible voluntary contractions of the synthetic sphincter. We believe that transplantation of the levator muscles may be used with profit in the repair of certain vesical sphincter defects in the female.

REFERENCES

- (1) *Brjosowsky, A.*: Arch. f. klin. Chir. 123: 117, 1923. (2) *Brown, B.*: Brit. M. J. 2: 390, 1863. (3) *Deming, C.*: J. A. M. A. 86: 823, 1926. (4) *Fraenkel, L.*: Zentralbl. f. Gynäk. 53: 333, 1929. (5) *Hans, H.*: Zentralbl. f. Chir.

56: 11, 1929. (6) *Key, E.*: Acta chir. Scandinav. 63: 545, 1928. (7) *Kneise, O.*: Zentralbl. f. Gynäk. 52: 497, 1928. (8) *Markoff, N.*: Gynec. et Obst. 18: 617, 1928. (9) *Martius, H.*: Chirurg. 1: 769, 1929. (10) *Noble, C.*: Am. J. Obst. 43: 170, 1901. (11) *Kelly, H., and Noble, C.*: Gynecology and Abdominal Surgery, Philadelphia and London, 1908, W. B. Saunders Co. 1: 501. (12) *Orcini, A.*: Ann. di Obstet. 50: 33, 1928. (13) *Perard, J.*: J. d'urol. 26: 193, 1928. (14) *Sellheim, H.*: Beitr. z. Geburtsh. u. Gynäk. 5: 185, 1905. (15) *Taussig, F.*: Am. J. Obst. & Dis. Child. 77: 881, 1918. (16) *Ward, G.*: Surg. Gynec. Obst. 25: 126, 1917. (17) *Idem*: Surg. Gynec. Obst. 37: 678, 1923. (18) *Wassilieff, B.*: Zentralbl. f. Chir. 55: 969, 1928. (19) *McGaw, W. H., and Douglass, M.*: Surg., Gynec. & Obst. 47: 408, 1928.

(For discussion, see page 788.)

THE RESPONSIBILITY OF THE MEDICAL PROFESSION IN THE MORTALITY FROM CHILDBEARING*

BY GEORGE W. KOSMAK, M.D., NEW YORK, N. Y.

SO MUCH has been spoken and written in recent years about the high mortality from childbearing in the United States that one hesitates to bring up the subject again before a group of this kind. Yet there are certain responsibilities which an organization of specialists should bear and which I may, or may not, be successful in defining. However I will venture the assumption in presenting this topic that it may be possible for a society which has an inherent interest in obstetrics to acknowledge a certain responsibility in an endeavor to better certain apparent shortcomings in this branch of medical practice. For somewhere there must reside a cause, or causes, for the undeniably high maternal death which characterizes childbearing in this country. It is high as compared with the mortality in other diseases and it is high as compared with that of many other countries.

The mortality rates of any particular group of diseases are high or low only in comparison with those of an earlier period or those that are current elsewhere at the present time. It is difficult to set a standard, for conditions vary in different countries and the basis for collecting statistics is subjected to equal variations. It has long been a favorite expression to state that the United States is nearly at the bottom of the list of civilized countries with respect to its puerperal mortality rate. Such invidious comparisons have served well in several widely spread publicity campaigns but in reality they can be dismissed in many instances when subjected to a keener analysis. Of what value is it, for example, to compare the United States with a nation like Chile, in which the gathering of vital statistics must be limited to a very small portion of the country. Or, on the other hand, with a closely knitted, homogeneous population like that of Holland,

*Read in part at the Forty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, Va., May 18-20, 1931, and at the Forty-fourth Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, White Sulphur Springs, September 15, 1931.

or Sweden, or Norway, in which the total number of people scarcely equals that of some of the more populous states or cities of this country. Be it remembered on the other hand that there are other countries of a high degree of civilization with mortality rates equally high. I believe such comparisons are of little scientific value, but aside from this we must admit that the mortality rates in this country are high if we compare them merely with those of other medical and surgical illnesses.

In view of the current propaganda in our own country, attention may be called to the fact that other nations are likewise deeply concerned about the high mortality incident to childbirth. The English Ministry of Health published only last year an extended report by a special investigating committee of which Sir George Newman was the Chairman. The puerperal death rate in England and Wales between 1911 and 1929 rose from 4 per 1,000 live births to 4.3. Admitting the very complex nature of the problem, the Commission believed that a general tightening up and strengthening was needed of each link in the chain of obstetric supervisions rather than any single, arresting or comprehensive remedy. Moreover the Commission concluded that an excessive puerperal mortality is largely preventable. It will be of interest to note the effect of the new midwife teaching and practice on the British rates. Belgium with a puerperal death rate of 5.5 per 1,000, Germany with 5.1, and other nations are similarly interested, although these rates are all apparently less than ours of about 6 per cent. As declared by Dr. Parran, the Commissioner of Health of New York State, in a recent address, the community, the state, or the nation which is not taking active steps to safeguard the health of its mothers is shirking one of the most important problems in the whole field of public health.

Is it possible to determine the reason or reasons for this apparent lack of improvement in obstetric practice as compared with other departments of medicine? It has been claimed among other things that a reduction in home confinements would bring about an improvement. During the last two or three decades, obstetric practice in the United States has been largely influenced by the hospitalization of an increasing number of pregnant women and yet practically no reduction in mortality rates has resulted. For example, in puerperal sepsis the rate has remained about the same for twenty years and it is undeniably high.

In the City of New York 122,811 births took place in 1930, of which 81,576 occurred in institutions. Midwives and "others" confined 12,109 women and these, with the "home" cases of physicians totalled 41,235. In other words, practically two-thirds of the deliveries in New York City took place in hospitals. And with what result?

Among the 122,811 births of over twenty-eight weeks there were 672 deaths of the mothers, or approximately 1 in every 183 cases, or 5.4 per cent. Almost one-third of the deaths were due to sepsis (32.5 per cent), 18.2 per cent to accidents of labor, and 16.4 per cent to toxemia, 12.9 per cent to hemorrhage, with scattering percentages of the remainder. Naturally it would be unfair to judge the deaths in the home deliveries compared with those in hospitals, because many more serious cases were in the latter. However if we evaluate the preventability of the cases whether in the home or in the hospital, and this has been attempted, about 67 per cent of the fatal cases might be designated as preventable.

The increased hospitalization of obstetric patients has resulted in another change, namely, an increased operative interference in deliveries, frequently of a major character, and it is nothing unusual at the present day to find institutions with an operative incidence of over 30 per cent among their maternity patients. What result can this have on the practice of obstetrics in general? Is it not fair to assume that the effect is a deleterious one? A careful analysis of certain studies on the subject that have been made and are being made in this country would seem to indicate that perhaps here we may have one explanation of our high maternal mortality.

I would venture to call attention at this point to these studies in greater detail. Among the most noteworthy and recent is that made by Drs. Adair, Mussey and Holmes¹ based on the investigation of over 2,500 puerperal deaths occurring during 1927, in 12 states of this country, well distributed geographically. It was found that septicemia accounted for 41 per cent, toxemia 23 per cent, puerperal hemorrhage 11 per cent, accidents of pregnancy and labor 18 per cent of the total. It is of interest to note that in almost 1,700 patients an operative procedure was done; about 12 per cent of these were forceps deliveries, 9 per cent cesarean sections and about 5 per cent podalic versions. Among the cesarean cases the causes of death as listed were toxemia in 38 per cent, the operation itself in 25 per cent, sepsis in 25 per cent, and hemorrhage in 10 per cent.

In a very complete study made by DePorte² of the Department of Health of the maternal mortality of New York State, between the years 1915 and 1925, the mortality rate was 58.5 per 10,000 total births; in other words, 1 in every 171 births resulted in the death of the mother. Diseases of the puerperal state were found to be second in order of importance among the causes of death of women between the ages of fifteen and forty-four, with 1 out of 9 deaths. The first place was held by tuberculosis, heart disease was third, and cancer fourth. Among married women from fifteen to forty-four years of age, puerperal causes were responsible for 1 in 5 deaths. A comparison of the rates in the first half with the second half of the decade

shows that the mortality from puerperal sepsis declined about 4 per cent, while that from toxemia in general was reduced 14 per cent, but the mortality from hemorrhage increased 14 per cent.

One of the most illuminating studies on this subject is the report made by E. D. Plass,³ of the State University of Iowa, to the recent White House Conference, in which the relation of forceps and cesarean section to maternal and infant morbidity and mortality is very carefully considered. He presents certain unpublished statistics of the Children's Bureau covering the maternal deaths in 13 states for 1927 and 15 states for 1928, which show that among 4,839 cases in which data are available, 2,225 patients, or 46 per cent, died after an operation done at delivery, 16.5 per cent following forceps, and 11 per cent cesarean section. There was also a high percentage of toxemia deaths in the operative groups. A questionnaire directed to 217 representative general hospitals which reported 120,999 deliveries during 1929 disclosed a forceps incidence of 17.9 per cent. Sixteen special obstetric hospitals reported over 24,000 deliveries with a forceps incidence of about 20 per cent. It is not possible to present any comparative figures, so that estimates as to the possible increase of forceps operations are not available except in a few instances, such as that of the Hartford General Hospital. In this institution we find, for example, that from 1916 to 1928 the forceps incidence increased from about 7 per cent to 16 per cent, although the number of deliveries was only increased from 985 to 1,507. Comparing these figures with foreign clinics, Plass found that the average of four very prominent European institutions was a little over 3 per cent. Of course in evaluating our American institutions the prevalence of the so-called prophylactic forceps operation must be borne in mind. This is rarely done abroad.

Plass takes up next the question of cesarean section and finds a cesarean incidence of 2.9 per cent in 119 hospitals in the United States which responded to his questionnaire. The ratio varied among these hospitals from a fraction of 1 per cent to over 14 per cent. Comparative studies also show that a decided increase in the number of sections was noted in a fifteen-year period. It is interesting to compare these high rates with those in foreign countries where the percentage varied from 0.6 per cent in Scandinavia to 3.9 per cent in Germany. The high percentages in certain German clinics are very adversely criticized by other leading obstetricians in that country.

Finally I desire to draw attention to another careful study of this kind which is now being conducted in New York City by a joint committee from the New York Obstetrical Society and the Academy of Medicine. In this a detailed analysis is being made of all deaths occurring during a three-year period, each case being subjected to a searching inquiry by a physician investigator within a week of the

occurrence so that the facts are still fresh in the minds of the doctor or midwife. Its extent and value must be evident from the fact that the city of New York alone averages over 120,000 births annually, of which about 80,000 occurred in institutions during the year 1930. During this same year there were 672 deaths in women over twenty-eight weeks pregnant, a rate of 5.4 per 1,000, about the same as that for the entire State. Unless some decided reductions occur in the succeeding two years, this would mean that over 2,000 women in New York City alone will die during this three-year period from puerperal causes as compared with 2,650 cases covered in the Holmes, Mussey and Adair compilation of 1927 which included 12 scattered states in the registration area. The study is not yet complete but the final report on the work of this committee will be awaited with interest and should constitute a practical basis for effective reforms if these are found necessary.

It is evident from the studies of puerperal mortality statistics made by competent observers, that among the fatal cases a considerable proportion gave a history of a previous operative delivery, usually about 50 per cent. Forceps, version, and cesarean section seem to constitute a trinity which must be viewed with trepidation and alarm if the published results are a criterion of its efficacy. Cesarean section at the moment seems to demand our special attention. No matter what arguments may be brought forward as to the safety or ease with which this operation can be done, it would appear from these perhaps limited statistics that a note of warning should be issued. Reports have shown that the incidence of cesarean section is high in many communities and it would seem opportune for this and similar societies to use their influence in curbing an operative instinct which contributes to a maternal mortality. The fault must be sought: either the indications for the operation have not been properly observed, the operative environment is defective, or the operator and his technique leave something to be desired. Cesarean sections by experts in leading institutions have been done in large series without a high mortality, and it is but natural to assume that if the operation is attended with a fatal outcome in so many cases, the operator or the environment must be at fault. Judging from the results obtained in New York City, cesarean section is evidently neither safe nor simple and should be reserved for those who know how to do it and who will honestly weigh the indications demanding this major procedure before attempting the same.

There are certain risks in childbearing which cannot be entirely eliminated, accidents in labor, hemorrhages, sudden unlooked for toxemias, intercurrent diseases, autogenous infections and perhaps a few others. But after making due allowances for these, there remains an uncomfortable feeling about a death rate from cesarean section

for example, which is much above that from purely surgical laparotomies, 5.7 per cent in a New York series in 1930 as compared with approximately 2 per cent in general surgical laparotomies, including we may assume an equal number of potentially bad risks. Does it mean that the obstetrician is a poor "laparotomist," if I may be allowed to use that term? If so, then a revision of our obstetric training is necessary, so that certain permissible limits may be established. Although this is a problem for the future, it is one that eventually must be faced and standards of competency recognized. A moderately satisfactory test of competency of an institution or an individual practicing obstetrics within its walls is the evaluation at stated intervals of the work done. This can be accomplished through the medium of staff conferences held every month as prescribed in the hospital standards promulgated by the American College of Surgeons. At such conferences every obstetric morbidity and mortality can be discussed and a comparison of the facts connected with the individual case should do much to explain or, if necessary, correct the handling of subsequent cases. Many institutions throughout the country have adopted this procedure and it should be extended to all. The scheme is not unusual or impractical and would be of mutual benefit. Of course, it cannot be applied to the individual practitioner of obstetrics nor in private hospitals or sanatoria in which there is no official staff or director. But even in the latter case the introduction of such a scheme of supervision would do much if honestly carried out to enhance the standing of the particular institution. In so far as home confinements are concerned, the individual practitioner is the only critic of his deeds. It is found, however, that comparatively few obstetric deaths result from ordinary home deliveries and that most of these are the result of, or accompanied by, operative intervention.

It is quite generally assumed that the wider acceptance of the principles of prenatal care has done much to reduce mortality from childbearing. This subject probably has been accorded greater attention in the United States than elsewhere and particularly during the last two decades it has constituted the chief feature in the nation-wide propaganda for better maternity care developed through the medium of various governmental and private social welfare activities. But notwithstanding the high degree which the system of supervising the pregnant woman has reached in the United States, and which is the envy of many obstetricians in foreign countries with which our own shortcomings are compared, little effect is apparent on our mortality statistics. It is true that the incidence of pregnancy toxemias has declined, but sepsis, hemorrhage and certain other perhaps preventable conditions claim about as many victims as before. There is but one lesson to be drawn from this; namely, that no matter how carefully the prenatal period may be supervised, what counts in the end

is the skill and knowledge with which the labor itself is conducted. Studies on obstetric mortality from various sources apparently confirm the assumption that unsatisfactory care during labor is the chief factor in producing our high maternal mortality.

The question remains, what can we do to change this state of affairs? Perhaps we have gone as far as we possibly can in the development of prenatal care standards, although it is quite evident that a certain proportion of pregnant women are either indifferent or ignorant of the necessity of such supervision. This lack of interest may perhaps be overcome by well directed effort, but at any rate, the blame cannot be cast entirely on the doctor. When we come to consider the results of the care during labor, little blame for the fatalities can be ascribed to the patient. It is difficult to evaluate the responsibility of the physician in labor but case studies such as those being made by the committee of the New York Academy of Medicine will undoubtedly furnish food for thought, in presenting an estimate at least of the preventable deaths.

Summing up in a general way the observations of widely scattered students of the subject, we might venture to claim that unsatisfactory care during labor depends on the following factors: (1) Lack of knowledge on the part of the public and ignorance in selecting an attendant for confinement. (2) Improper or insufficient education of the physician in the appreciation of the importance of proper technic in deliveries. (3) The desire to terminate labor rapidly by operative interference and to alleviate the so-called pangs of childbearing by indiscriminate narcosis and analgesia. (4) Improper use of hospital facilities, particularly those of a low grade. (5) Insufficient attention to methods of training the midwife and the development of satisfactory supervision over her work.

The mere statement of these conditions is of little value unless steps are taken to follow them up. In the discussion on his report at the recent White House Conference on prenatal and maternal care, the late John O. Polak stated in addressing this audience of specially interested persons, that the basic thing in the situation was whether we should put ourselves on record in favor of a nation-wide campaign for better obstetrics. The details of such a problem are secondary and must be handled by each locality to the best of its ability, but a nation-wide program can only be developed by interested organizations acting in unison. The White House Conference brought out quite clearly what the essentials of such a program should be. Firstly, it includes better medical education and training for the physician in obstetrics in the widest sense. Secondly, it means the improved training of nurses and midwives. A satisfactory and practical scheme of midwife education and supervision must eventually be organized, although professional sentiment in this country heretofore has been opposed to this

kind of extramural practitioner. Yet the results have been so good where the method has been given a trial, that the physician must learn to regard the question of midwife practice in a broader way. Thirdly, the program means the education of the patient and the doctor and the various governmental groups as to what can be accomplished by consecutive care of a pregnant woman in every stage of this process. The medical participation in all parts of this program is of paramount importance and as physicians we can contribute the most substantial aid in its development. The country has been aroused in recent years to the importance of the problem of better obstetric care and this agitation has culminated in the deliberations proceeding from the White House Conference. It is hoped that the permanent committee which is to be the outgrowth of this conference will seize upon the opportunity for a close affiliation with the professional groups which are directly concerned, so that a concerted effort may be made to improve a situation, the blame for which is being rapidly fastened on the doctor and from which he can only extricate himself by his own efforts.

23 EAST NINETY-THIRD STREET.

Gundel, M., and Oettingen, KJ.: Studies on the Bacterial Content of the Uterine Cavity in the Pregnant and the Non-pregnant Woman. *Zentralbl. f. Gynäk.* 54: 327, 1930.

The uterine cavity of the nonpregnant individual, as determined in a series of uteri obtained at abdominal sections for various causes is sterile except in a few cases of submucous myomata. The uterine cavity of the pregnant woman, on the other hand, is not always free of bacteria. Using the ordinary bacteriologic technic, bacteria such as *Doederleins*, *Diplostreptococcus*, and in a single case, *Staphylococcus albus*, were found in about half of the cases. The primary seat of these organisms probably is the vagina. The amniotic fluid was always sterile, but bacteria were found in the membranes, decidua, and in uterine and cervical smears. The author has nothing to say concerning the mode of entrance of these bacteria, and does not believe that a prognosis as to the outcome of cesarean section can be made. None of this holds, however, after vaginal manipulation has introduced pathogenic bacteria into the vagina.

WILLIAM F. MENGERT.

THE NATURE OF URINARY PROTEIN IN ECLAMPSIA*

BY NICHOLSON J. EASTMAN, M.D., BALTIMORE, MD.

(From the Department of Obstetrics, Johns Hopkins Hospital and University)

THE ratio of albumin to globulin in the urine of patients suffering from nephritis appears to bear a somewhat constant relationship to the type and severity of the renal disease present. Thus, Hiller, McIntosh and Van Slyke¹ have found that it is usually above 10 in nephrosis, between 5 and 10 in acute nephritis, while in the advanced stages of chronic glomerular nephritis with urea retention and impaired kidney function, it falls below 5. They note, moreover, that cases of acute nephritis show a low ratio during the early stage followed by a higher one during recovery. In view of such facts, these authors attach a certain prognostic significance to the albumin:globulin ratio of the urine in nephritis and agree with the earlier students^{2, 3} of the subject that in general the prognosis is grave in patients showing relatively high urinary globulin.

The nature of the urinary protein excreted in the various toxemias of pregnancy has apparently received little attention. The only approach that has been made to the problem, indeed, seems to be the study of Wallis⁴ reported in 1921, although Dr. Williams tells me that Emerson and Slemons many years ago made some observations in this service, which were not published. Wallis applied certain refractometric and nephelometric tests to the urinary proteins in various conditions and reached the conclusion that in "toxic albuminuria," including eclampsia, the ratio of albumin to globulin was 2 to 1, while in nephritis it was 6 to 1. As the result of this study, he regards the urinary albumin:globulin ratio as a valuable means of differentiating preeclampsia from nephritis.

The present paper reports a quantitative study of the urinary albumin and globulin in 21 cases of toxemia of pregnancy. The group comprises 9 cases of eclampsia, 4 of preeclampsia, 6 of chronic nephritis, and 2 of nephrosis complicating pregnancy. In several instances the corresponding figures for the serum proteins were also determined.

METHODS

A freshly catheterized specimen of urine was first adjusted to a P_H just alkaline to phenol red. As shown by Hiller,⁵ failure to carry out this adjustment may lead to gross error in the subsequent precipitation of globulin. Samples of the adjusted urine were then subjected to the following three procedures:

*Read at a meeting of the Baltimore Obstetrical and Gynecological Society, March 13, 1931.

1. A 5 c.c. portion was analyzed for total nitrogen by the Kjeldahl method. The resultant figure in grams, which we will call A, equals nonprotein nitrogen, plus albumin nitrogen, plus globulin nitrogen.

2. To a 10 c.c. portion an equal volume of 44 per cent sodium sulphate was added, thereby precipitating the globulin. After standing at 38° C. for two hours, the coagulated globulin was filtered off and Kjeldahl analysis applied to a 10 c.c. sample of the filtrate. The resultant figure in grams, which we will call B, equals nonprotein nitrogen, plus albumin nitrogen.

3. To another 10 c.c. portion an equal volume of 10 per cent trichloroacetic acid was added, precipitating all the protein. After filtration, Kjeldahl analysis was carried out on a 10 c.c. sample of the filtrate. The resultant figure in grams, which we will call C, equals nonprotein nitrogen.

The calculation becomes then as follows:

$$(B - C) \times 6.25 \times 200 = \text{Albumin in grams per liter.}$$

$$(A - B) \times 6.25 \times 200 = \text{Globulin in grams per liter.}$$

All analyses were done in duplicate. In most instances, moreover, it was possible to examine several specimens of urine from the same patient so that our figures in reality represent averages over periods varying from a few hours to six months. The number of specimens examined in each case is listed in the last column of Table I.

The figures reported in this study are based entirely on the Kjeldahl procedure just described since we believe that the values it yields

TABLE I. SHOWING THE RELATIONSHIPS OF THE URINARY PROTEINS AND OF THE SERUM PROTEINS IN VARIOUS CONDITIONS COMPLICATING PREGNANCY

CASE NO.	DIAGNOSIS	SERUM PROTEINS			URINARY PROTEINS			NUMBER OF ESTIMATIONS
		ALBU-MIN GM. PER 100 C.C.	GLOB-ULIN GM. PER 100 C.C.	A : G	ALBU-MIN GM. PER LITER	GLOB-ULIN GM. PER LITER	A : G	
1	Nephrosis	1.0	3.0	0.3	5.8	0.4	14.0	9
2	Nephrosis	2.6	3.2	0.8	3.8	0.3	12.6	4
3	Nephritis	3.2	2.0	1.6	4.0	0.5	8.0	5
4	Nephritis				8.9	1.1	8.0	2
5	Nephritis				3.6	0.6	6.0	2
6	Nephritis	3.2	1.9	1.7	3.5	0.6	5.9	4
7	Nephritis (fatal)	2.9	2.0	1.4	16.0	3.6	4.4	3
8	Nephritis				7.6	1.0	7.6	2
9	Preeclampsia	3.1	2.3	1.3	4.0	1.0	4.0	3
10	Preeclampsia				7.1	2.8	2.5	2
11	Preeclampsia	3.4	2.7	1.3	3.7	1.4	2.6	2
12	Preeclampsia				5.3	1.8	2.9	1
13	Eclampsia	3.7	2.5	1.5	8.8	2.5	3.5	2
14	Eclampsia				9.2	4.0	2.2	1
15	Eclampsia	3.0	2.6	1.2	29.1	8.1	3.6	3
16	Eclampsia				7.1	2.9	2.4	2
17	Eclampsia				3.0	1.2	2.5	2
18	Eclampsia				6.8	2.6	2.6	3
19	Eclampsia				14.2	5.0	2.8	1
20	Eclampsia	2.8	2.0	1.4	16.7	5.5	3.0	2
21	Eclampsia				4.8	1.2	4.0	3

more nearly approximate the true ones than those given by any other method. It may be noted in passing, however, that in most cases we have made parallel determinations by the more rapid colorimetric

method of Hiller⁵ and find that the albumin:globulin ratios thus obtained agree approximately with those given by Kjeldahl analysis. In our hands, however, the Hiller procedure has given higher absolute values for protein than the Kjeldahl.

The serum proteins were determined by a modification of the Greenburg method.⁶

RESULTS

The detailed results of the study are listed in Table I, while the average figures for the various conditions investigated are shown diagrammatically in Chart I. The outstanding finding of our study was the large amount of globulin present in the urine of eclamptic and pre-eclamptic patients. The urinary globulin in eclampsia, indeed, was found to comprise 26 per cent of the total protein present, and in pre-eclampsia 25 per cent. In nephritis, on the other hand, globulin con-

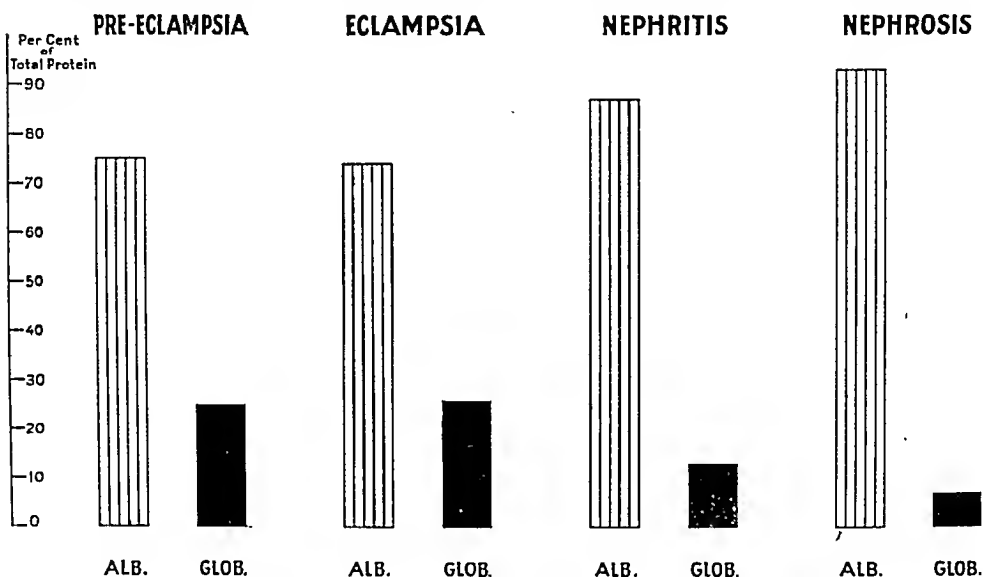


Chart I.—Showing the average findings for urinary albumin and globulin in various conditions complicating pregnancy, expressed as percentages of total protein.

stituted but 13 per cent of the urinary proteins and in nephrosis only 7 per cent (Chart I). Expressed in terms of the albumin:globulin ratio, the average ratio in eclampsia and preeclampsia was found to be 3, while in nephritis it approximated 7 and in nephrosis averaged about 13. It will be noted further that in all of the eclamptic and pre-eclamptic patients the ratio fell below 5, a level usually associated with the severest type of nephritis. In our group classified as nephritis the albumin:globulin ratio only once fell below 5 (Case 7); and this was an advanced case terminating in death shortly after admission.

The cases listed as nephrosis complicating pregnancy were apparently genuine types of the disease since they manifested normal blood pressure, marked proteinuria, edema, high blood cholesterol and the characteristic inversion of the serum protein ratios.

COMMENT

The phenomenon of proteinuria, according to our present conception, is localized in the renal glomerulus. If the capillaries composing this body are normal, the serum proteins, by reason of their large molecular size, are retained within these vessels; but if, on the other hand, the capillary walls have been injured, the serum proteins pass through them at once into the urine. While the injury is usually the result of disease processes, it may be produced experimentally by causing a temporary asphyxia of the vessel walls; thus, Nussbaum⁷ has found that intermittent occlusion of the renal artery causes immediate proteinuria. Adrenalin given in sufficient doses to constrict the renal vessels also induces a transient proteinuria,⁸ and in the cat the constriction caused by fright or by the inhalation of CO₂ may have the same effect. The glomerulus which permits proteinuria may accordingly be compared to a filter which through injury has become so porous as to allow even large particles to pass into the filtrate.

It follows as a necessary corollary to this conception of proteinuria that the serum albumin molecule, which is smaller than that of serum globulin, may be expected to pass more readily through an injured glomerulus and conversely that a proportionately greater degree of injury will be necessary to permit the passage of the large globulin molecule. The theoretical evidence, then, is in full accord with the clinical findings of Hiller, McIntosh and Van Slyke, and of other investigators in this field, and lends support to the view that urinary globulin, when present in large amounts, indicates a severe lesion of the glomerular capillaries. Accordingly, the present study, which shows that the urine of eclamptic patients contains a very high percentage of globulin, permits the interpretation that the glomerular changes in this disease are of extreme intensity. On the basis of our results, indeed, the permeability of the glomerular capillaries in eclampsia appear to undergo greater alterations than are encountered in any other condition with the exception of amyloid degeneration of the kidney. Accordingly, these biochemical findings afford further evidence that increased capillary permeability may play an important rôle in the pathology, and perhaps even in the etiology of eclampsia.

It has been noted in a previous communication⁹ that in pregnant patients suffering from nephritis, heavy protein excretion in the urine is accompanied in almost all cases by a protein deficit in the blood plasma and that when the serum proteins fall below 5 grams per 100 c.c., general edema is usually present. The relation between protein deficit and edema formation in our previous series was not, however, strictly regular and uniform, and consequently it was concluded that in addition to the diminution in serum proteins, some other important factor must be concerned in the water balance of these patients. A study of the present series of eclamptic patients lends further

support to such a supposition, in that 6 of them manifested marked general edema, yet showed serum proteins well within the normal range. We feel that it is significant in this connection that during the first weeks of acute glomerular nephritis (like eclampsia, a disease associated with high urinary globulin) edema may occur even though the plasma protein level is normal. Van Slyke and his associates¹⁰ hold that the edema must be due to some factor quite apart from the osmotic effects of the plasma proteins and believe that it may result from some toxic action which increases capillary permeability. Certainly in conditions in which the capillaries are so permeable as to permit the passage both of albumin and globulin, the osmotic effect exerted by the plasma proteins, which is dependent upon the integrity of the separating membrane, must be minimal. It accordingly appears probable that in eclampsia, just as in acute nephritis, increased capillary permeability, even more than diminution in plasma protein, must be the dominating factor in producing general edema.

In the early part of this study it was hoped that the determination of the urinary albumin:globulin ratios in the toxemias of pregnancy might be of considerable diagnostic and prognostic help. In general, however, this is not the case. In the first place, in order to determine this ratio accurately, it is necessary for the urine to contain at least 3 gm. of protein per liter, a fact that at once excludes a great number of patients in whom hypertension rather than proteinuria is the outstanding clinical sign. It has been our experience, moreover, that patients who do show 3 or more grams of protein per liter are just the ones in which the usual diagnostic criteria are most conclusive, so that from a practical point of view the consideration of the albumin:globulin ratio becomes unnecessary.

CONCLUSIONS

1. The urinary protein excreted in eclampsia is characterized by an extremely high globulin content, the urinary albumin:globulin ratio in this disease averaging about 3.

2. In nephritis and nephrosis complicated by pregnancy, the urinary albumin:globulin ratios are higher; averaging in the present series 6.7 for nephritis and 13.3 for nephrosis.

3. It is suggested that the high globulin content of the urine in eclampsia is a direct result of the increased capillary permeability associated with that disease.

REFERENCES

- (1) *Hiller, A., McIntosh, J. F., and Van Slyke, D. D.*: J. Clin. Invest. 4: 235, 1927. (2) *Cloetta, M.*: Arch. f. exper. Path. u. Pharm. 42: 453, 1899. (3) *Autenrieth, W.*: München. med. Wehnschr. 64: 241, 1917. (4) *Wallis, R. L. M.*: J. Obst. & Gynec. Brit. Emp. 28: 3, 1921. (5) *Hiller, A.*: Proc. Soc. Exper. Biol. & Med. 24: 385, 1927. (6) *Greenburg, D. M.*: J. Biol. Chem. 82: 545, 1929. (7) *Nussbaum, M.*: Pfüger's Arch. f. d. ges. Physiol. 16: 139, 1878. (8) *Cushny, A. R.*: The Secretion of the Urine, London, 1926, p. 243. (9) *Eastman, N. J.*: AM. J. OBST. & GYNEC. 19: 343, 1930. (10) *Van Slyke, D. D., and others*: Medicine 9: 257, 1930.

A SIMPLE TECHNIC FOR CESAREAN SECTION UNDER LOCAL INFILTRATION ANESTHESIA*

BY HERVEY C. WILLIAMSON, M.D., NEW YORK, N. Y.

CESAREAN section, as performed, with the incision in the mid line between the umbilicus and the symphysis, is particularly well suited for the use of local infiltration anesthesia. There are three reasons for this. First, the lower segment of the uterus is directly below the incision; second, there is no necessity for extensive wound retraction and third, the intestines are rarely encountered, thereby making laparotomy pads unnecessary.

There are several advantages in this procedure which fully justify its use. Local anesthesia does not impair the contractility of the uterine muscle so that there is usually much less bleeding than there is when a general anesthetic is given. The postoperative convalescence is usually quite comfortable, vomiting rarely occurs, there is generally but little distention and smaller amounts of opiates are required than when a general anesthesia is administered. There are none of the disadvantages of inhalation or the potential dangers of spinal anesthesia.

Active labor is not a contraindication, but the patient will continue to have labor pains until the uterus is emptied. Local anesthesia is of special value when labor has been unduly prolonged and the patient is suffering from acidosis. Nephritis, pulmonary and cardiac disease are important indications for its use.

We have found no disadvantage in the use of this method. For the nervous type of woman, or for one who fears an operation, inhalation anesthesia may be better suited. Private patients, or those who have been about the ward for a time, are usually very good subjects because we become better acquainted with them and they have less operating room phobia.

As the use of local infiltration anesthesia for this operation is well established in this country, my purpose in this paper is to detail a simple and satisfactory technic and, in addition, to discuss briefly some of our results.

TECHNIC

Three hundred cubic centimeters of a sterile solution of 0.5 per cent novocaine to which one c.c. of 1-1000 solution of adrenalin chloride has been added, is prepared. This is the formula of the solution used at the DeLee Clinic. A syringe of the Labat type, preferably with ring handles, and two needles are the only special instruments required. One of these two needles is of small size, for the

*Read at a meeting of the New York Obstetrical Society, March 10, 1931.

initial wheal and the other, No. 50.7 (A. F. Co.), 5 cm. long, is used for the remainder of the infiltration.

The usual preparation for a laparotomy is made. The patient is placed in a slight Trendelenburg position and made as comfortable as possible. A thick mattress on the operating table is advantageous. The eyes should be covered with a towel and the ears loosely plugged with cotton so that the patient is not disturbed. Small amounts of cracked ice may be given during the operation.

The skin is infiltrated along the median line below the umbilicus. Novocaine should be injected as the needle is advanced and withdrawn, keeping it close to and parallel with the skin. The lower part of the skin area, the portion near the symphysis, must be infiltrated fanwise. This is most important. When the patient does not feel a skin prick, the skin and fat is opened down to the fascia. This is then infiltrated in the same manner and opened. Dissection, so far as possible, is made with a sharp scalpel, rather than with scissors and all the tissues must be handled very carefully. The needle is then placed in four positions, two on either side, through the fascia at right angles to the incision for a distance of 2 to 3 cm. and 5 c.c. of novocaine is injected into each area. The purpose of these injections is to anesthetize the deeper branches of the dorsal and lumbar nerves, as demonstrated at the DeLee Clinic. A small opening in the parietal peritoneum is then made at the upper angle of the wound, Allis clamps are attached on either side of this opening and the peritoneum is infiltrated a needle's length. This infiltrated area is then incised, the clamps are shifted lower and the procedure repeated until an adequate opening has been made. As the parietal peritoneum is the most sensitive tissue encountered, great care must be exercised at this stage. Except for the fingers of the assistants, we use no retractors at any time, all retraction of the wound being done with extreme care. The greatest discomfort is caused by pulling the parietal peritoneum. The visceral peritoneum over the lower uterine segment is then infiltrated so that this loose tissue is raised from the muscle. This facilitates the dissection of the two flaps in the low flap operation. A hypodermic injection of $\frac{1}{4}$ gr. of morphine sulphate (gm. 0.016) and $\frac{1}{100}$ gr. of scopolamine hydrobromide (gm. 0.0006) is given to the patient during the dissection of the flaps. It is given at this late stage to prevent untoward effects on the baby. One cubic centimeter of pituitary extract is given just before the uterus is opened. An inhalation of nitrous oxide and oxygen is now given for about one minute, while the uterine muscle is incised and the baby withdrawn. The uterine muscle is not sensitive but the change in intraabdominal pressure caused by extracting the baby, makes this step painful unless the gas is given. The placenta is removed by making traction on the cord. The uterine incision is closed with interrupted chromic catgut sutures superimposed by a continuous plain catgut suture of the Cushing type. The upper flap is now attached to the uterus on either side of the uterine incision and the lower flap drawn well up and sutured with a continuous plain catgut suture. The most important feature in closing the abdomen is the suture of the parietal peritoneum, which must be done with little traction. A small, sharp, cutting needle is better for this purpose than the usual round one. The remaining layers of the abdomen may be closed in the customary manner, no further injection being necessary. Often the patient is comfortably asleep at the conclusion of the operation.

I wish to report briefly 32 personally performed operations and 26 others from the Second (Cornell) Obstetrical Division at Bellevue Hospital and from the Manhattan Maternity and Dispensary. The indications in these cases were: contracted pelvis, before and after trial labor; central and partial placenta previa; accidental hemorrhage; preeclamptic toxemia of pregnancy and nephritis; pulmonary tuberculosis and cardiac disease. In short, these were all the usual indications for cesarean

section. No maternal deaths occurred and there were but two serious complications in the personal series. One patient with nephritis had a severe bronchitis and coughed so much after the operation that the abdominal wound opened. General anesthesia was given and the wound resutured, following which she developed bronchopneumonia, but recovered. A second patient developed a double femoral phlebitis, necessitating a long stay in the hospital. In our 1930 series at Bellevue Hospital we had some superficial wound infections, none of which was serious. This also occurred when general anesthesia was used, so could not be attributed to the use of the local infiltration. There were several instances of morbidity, as defined by obstetric standards, but the cause was usually evident and had nothing to do with the operation per se. We may conclude that anesthesia by local infiltration offers a simple and effective method for performing the operation of cesarean section, either of the so-called low classical or flap splitting type.*

175 EAST SEVENTY-NINTH STREET.

(For discussion, see page 802.)

NUPERCAINE SUBDURALLY IN OBSTETRICS†

By S. A. COSGROVE, M.D., F.A.C.S., JERSEY CITY, N. J.

(From the Department of Obstetrics of the Jersey City Hospital)

WE HAVE used novocaine by lumbar injection in 1,788 out of a total of 8,503 deliveries up to March 1, 1931. Failure of anesthesia has been less than 2 per cent; there have been no mortalities; worrisome immediate reactions have been few in number and limited to our earlier inexpert period. Headaches followed in 18 per cent; of these 20 per cent, or 3.6 per cent of the total, have been severe for a few days; two cases only (0.11 per cent) lasted four and twelve weeks respectively, but finally disappeared completely. One case of mild paresthesia of the thigh lasted eight weeks.

This type of anesthesia has commended itself because it is absolute; the patient's consciousness is retained for a certain amount of voluntary cooperation; good technic is maintained by quietude of posture; patients with respiratory infections, acute or chronic, with heart disease, nephritis, diabetes, hypertension, and toxemia, are spared the noxious effects of inhalation anesthesia; the fetus has no apnea whatever due to the anesthetic, even after the late use of morphine.

Therefore we consider it the method of choice for the operative termination of the second stage of labor. It is restricted to this, however, by its short duration, which does not exceed an average of about forty-five minutes. It has no place, therefore, as a first stage analgesic. This we have regretted because we believe that if an agent could be found which would give anesthesia prolonged to the duration of aver-

*When this paper was read I stated that "since the completion of this paper we have done five more cases, making a total of sixty-three." Several days later one of these patients died. At autopsy the uterine wound was found to be infected and peritonitis had developed. The operation was in a clean, elective case.

†Read at a meeting of the New York Obstetrical Society, March 10, 1931.

age labor, it might be possible to attain the ideal of a painless labor without danger to the mother or the infant.

In nupereaine we hoped we had found such an agent. It is manufactured by the Ciba Company; was introduced in Europe under the name of pereain in 1929, and in this country as nupereaine, late in the same year. Chemically it is hydrochloride of alphasbutyloxyneohomonic acid diethylethylen dioxide; it is offered for topical use, local infiltration, spinal and caudal injections. Its chief claim is said to be the very long duration of the anesthesia as compared with that of other agents; it has been said to produce spinal anesthesia lasting an average of eight hours.¹

The spinal anesthetic dose advised is 10 mg. in 1:200 solution; much larger doses have been safely used, and appear to be within the toxic limit. But following the principle of keeping the obstetric dose definitely smaller than that necessary in the more extensive manipulations of general surgery, we have used only 5 mg., injected into L-3 or L-4. We have used it in 51 patients since October 1, 1930, and have used for comparison during the same period, 33 patients in whom spinal novocaine was employed, and 50 patients who did not receive any form of subdural medication. Such comparison gives the following results:

Spontaneous Delivery		
Primigravidae		
No Anesthetic*	17 out of 17 cases—	100 %
Nupercaine	1 out of 8 cases—	13 %
Multigravidae		
No Anesthetic	31 out of 32 cases—	96.9%
Nupercaine	24 out of 35 cases—	68.5%
All cases		
No Anesthetic	48 out of 49 cases—	97.9%
Nupercaine	25 out of 42 cases—	59.5%

All of the cases in this table were carefully chosen to eliminate known dystocia in relation to the present labor. Therefore there should have been about the same proportion of spontaneous deliveries in the group submitted to nupercaine as in the group not so treated, provided nupercaine did not interfere with the labor. But the table exhibits an average reduction of nearly 40 per cent of spontaneous deliveries in the nupercaine group.

A comparison of the duration of labor shows the following:

	<i>Spontaneous Labors</i>	
	<i>Primigravidae</i>	<i>Multigravidae</i>
No anesthesia	12 hr. 35 min.	8 hr. 25 min.
Nupercaine	16 hr. 53 min.	11 hr. 41 min.

(This table exhibits definitely a prolongation of the duration of labor by nupercaine.)

*"No Anesthetic" in this table means none except small whiffs of ether in some of the cases, at the termination of the second stage.

Both these actions are due to the fact that spinal anesthesia by any agent lessens the efficiency of labor, probably partly by diminution of the force of uterine contractions, and more effectively by practically eliminating the action of the auxiliary forces. Nupercaine does not differ in any degree from other agents in this respect.

Amnesia is not present. The relief of pain during the anesthesia is complete, but patients will evaluate this relief variously in relation to the pain suffered before the anesthetic is administered, so that their net impression of the "painlessness" of the labor gives but indefinite information, and statistics are of only very broad value. Three out of 29 patients (10.3 per cent) who had no anesthesia, stated that labor was "not painful." The same statement was made by 2 out of 21 patients (9.5 per cent) whose second stage was terminated under inhalation anesthesia and by 54 out of 84 patients (64.5 per cent) whose second stage was terminated under spinal anesthesia. So that the lasting impression of their labor experience would seem to be definitely better in the group delivered under spinal anesthesia.

In our vaginal deliveries the standard dose of novocaine is 50 mg., as compared to average doses for general surgery of from 120 to 150 mg. The percentage of unsatisfactory anesthesia is less than 2 per cent.

For similar purposes we used in this series 5 mg. of nupercaine, the average surgical dose being 8 to 10 mg. The anesthesia was variously incomplete or unsatisfactory in 18 out of 51 cases, or 35.5 per cent, even after a lapse of fifteen minutes or longer following injection, 10 per cent being so imperfect as to require supplemental anesthesia. (Keys and McLellan,² who were among the first to report the use of this drug from an American clinic, had 21.7 per cent of imperfect anesthetics.) We recognize that the small dosage used may be responsible for these results, but if the employment of full dosage for restricted fields of work is necessary, then nupercaine is less flexible than other agents with which the dose may be varied in proportion to the extent of anesthesia required. In estimating the above results, all cases have been eliminated in which there was any possibility that unsatisfactory anesthesia depended on failure to properly introduce the anesthetic agent into the canal.

The duration of anesthesia varied from two to six hours, the average for the whole group being four and one-half hours, the average for two-thirds of the group, five hours. This substantiates the claim of nupercaine for much longer duration of anesthesia than other agents (novocaine, average forty-five to sixty minutes, maximum not in excess of two hours). Such prolongation of anesthesia is of inestimable value in some types of surgery, but is not sufficient to cover the duration of the first and second stages of average labor.

We found no evidence of shock or respiratory embarrassment. Blood pressure fall has been negligible in the dose we have employed

(50 mg. ephedrine is used as routine preliminary medication). There has, however, been nausea or vomiting in nearly half the cases and headache in 90 per cent of cases. The latter has impressed us as being excruciatingly severe in nearly all the cases in which it has occurred, and begins within three to six hours after the injection, instead of some considerable time later, as is generally the case with novocaine. We do not recall having observed headache from intraspinal novocaine which is of comparable severity to that observed with nupercaine. In Vienna also there was an acknowledged incidence of headache in about 30 per cent of cases.¹ In fairness it must be stated that Keyes and McLellan² had only one "spinal headache" in 46 cases, and only 3 cases of postoperative vomiting. Francis C. Edgerton "has used nupercaine . . . in over 300 cases with infrequent occurrence of headache."³ At Bellevue Hospital,^{4, 5, 6} where nupercaine has been used on the surgical and genitourinary services, there have been no more headaches from nupercaine than from novocaine; on the fourth surgical division headache has not been noted.

We are at a loss to completely account for our own high proportion of headaches, because our technic has been identical with nupercaine and with novocaine, and does not differ essentially from that used in the other clinics quoted, except that our dose is smaller.

We constantly observed very much increased cerebrospinal fluid pressure during uterine contractions and voluntary bearing down efforts. During labor, uterine contractions, more or less modified in force, persist under spinal anesthesia, and in our patients the voluntary use of the auxiliary forces is frequently encouraged. Therefore we can assume that in the obstetric use of spinal anesthesia there is a factor which consists of sharp change in cerebrospinal fluid pressure not present in its surgical use. Such a factor may be of importance in the production of anesthetic headache. It is perhaps significant in this regard that patients who have had cesarean section under spinal anesthesia are less apt to suffer from headache than are those who have delivered vaginally under it. In the section cases the uterine contractions against resistance do not persist long after the injection, and voluntary bearing down efforts are entirely eliminated.

Obstetric sequelae attributable to the anesthetic other than the increased incidence of operative delivery, have not been noted.

SUMMARY

1. Spinal anesthesia is of great usefulness in obstetrics, as an anesthetic for the operative termination of labor.

2. Nupercaine is less desirable than novocaine for such purpose because: (a) Perfect anesthesia is not so uniformly obtained. (b) Symptomatic reactions, nausea and vomiting, and especially very severe headache, are more frequent. (c) The acknowledged longer duration

of anesthesia due to nupercaine does not constitute an advantage in obstetric practice sufficient to offset the disadvantages noted.

Acknowledgment is hereby made of much painstaking work in handling and observing the material for this report, to Jessie D. Reed, M.D., Chief Resident Obstetrician, Jersey City Medical Center.

REFERENCES

- (1) *Preissecke, Ernest*: Frauen Klinik II, Vienna, personal communication.
- (2) *Keyes, Edward L., and McLellan, Allister M.*: Am. J. Surg. 9: 1, 1930.
- (3) *Haskell, Chas. C.*: Personal communication. (4) *Lewis, Kenneth*: Personal communication. (5) *Emy, Sabro*: Personal communication.

254 UNION STREET.

(For discussion, see page 802.)

SARCOMA OF THE UTERUS

BY LOUIS P. KASMAN, M.D., BROOKLYN, N. Y.

(From the Koster Clinic, Crown Heights Hospital)

SARCOMA of the uterus is not as rare a disease as most of the text-books claim. This is particularly true of those sarcomas which develop from fibromyomas of the uterus. The sarcomatous growth developing from the uterine mucosa and usually assuming the botryoid form is another rather rare type of tumor. Yet the most unusual and clinically most puzzling type of sarcoma is that which develops within the wall of the uterus. Such an intramural sarcoma came to our observation and shall be reported as follows:

A female patient aged fifty-three was admitted into the hospital August 15, 1930. Patient's history revealed that in the early part of May, 1930, she was given radium treatment in order to stop irregular uterine bleeding due to a fibroid uterus. Fifty millieures of radium were inserted into the uterine canal and were permitted to remain there for twenty-four hours. Bleeding stopped within the next twenty-four hours and the patient remained well until August 14, 1930, when she was suddenly seized with severe cramp-like pains in the lower abdomen. She also felt faint and nauseated. Vaginal bleeding started again. Examination revealed tenderness and rigidity in the lower abdomen equal on both sides. Pressure-release tenderness was present in the lower abdomen. Vaginal examination revealed the cervix in normal axis, normal consistency, and closed. The uterus was freely movable, anteverted, anteflexed, and enlarged to the size of a two months' pregnancy. There was a suggestion of a mass present on the posterior superior surface of the fundus. The remainder of the examination was essentially negative.

Urine examination was negative. W. B. C. 14,100, polymorphonuclears 82 per cent, lymphocytes 14 per cent, monocytes 4 per cent, hemoglobin 75 per cent, R. B. C. 3,800,000. A preoperative diagnosis of a twisted fibroid of the uterus was made. A laparotomy was performed under spinal anesthesia. A large amount of free blood was found in the peritoneal cavity. There was a perforation of the fundus of the uterus about 1 cm. in diameter to which a fold of the sigmoid-junction was adherent. Both tubes and ovaries showed the evidence of a chronic inflammatory condition. A chronic obliterative appendicitis was found. A supracervical hysterectomy

tomy and appendectomy were performed. Patient made an uneventful recovery and was discharged from the hospital August 31, 1930.

The removed uterus was about the size of a small grapefruit, of irregular shape with an eccentric enlargement on the left side of the fundus. Slightly toward the posterior surface near the fundus there was an irregular defect, about 2 cm. in diameter filled with bloody material. This defect led into a cavity within the uterine wall. Section made through the entire uterus showed a thickened and somewhat fibrotic uterine wall without any intramural or subserous fibroid nodules. The uterine cavity appeared like a narrow rent with a slightly thickened and congested mucosa. The cavity which opened upon the surface was very irregular in shape and was surrounded by a somewhat softer fleshy tissue which bulged into the cavity in the shape of cauliflower-like projections. These projections were covered with a bloody material. Similar material filled out the smaller spaces between these projections. The color of the tissue from the wall of the cavity was of a grayish white color with pinkish mottlings. This tissue was not very sharply demarcated from the surrounding uterine tissue.

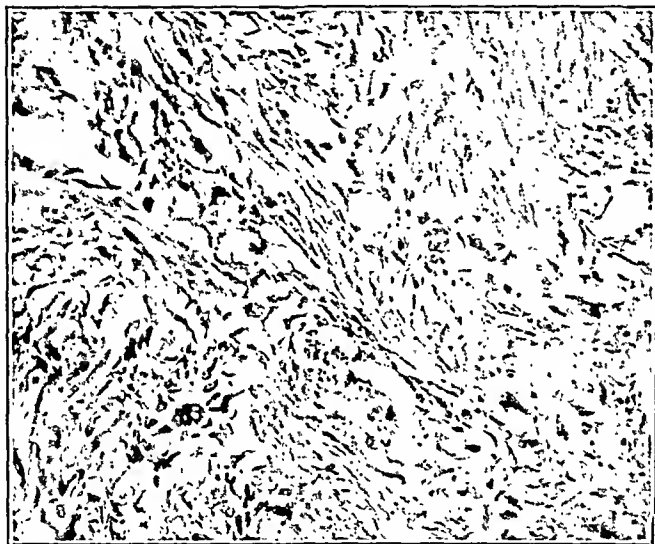


Fig. 1.—Intramural sarcoma of the uterus. Remnants of the myometrium are surrounded by the sarcoma tissue which shows polymorphous nuclei and a reticulated stroma.

On microscopic examination the tumor tissue forming the wall of the cavity consisted of very irregular polymorphous cells, most of which were spindle shaped or stellate. They were interconnected with a network of fine fibrils which did not stain well with acid dyes. The nuclei were of unequal size and shape. Some of them were hyperchromatic, others were more vesicular with irregular distribution of their chromatin.

Examination of the borderline between the tumor tissue and the uterine musculature showed that the tumor cells invaded the myometrium and forced their way between the larger bundles of the musculature. Islands of tumor cells were found between the muscle bundles at a distance and were apparently not directly connected with the main mass of the tumor. Invasion of veins or lymph vessels could not be ascertained. The diagnosis of a mixed cell sarcoma was made. No decision could be derived at whether the connective tissue or the musculature could be considered as the matrix of this sarcoma.

C. Mayer in 1860 first described sarcoma of the uterus which was later confirmed by Virchow in 1867. G. Viet in 1867 described three cases of sarcoma of the

uterus, one of which was sarcoma of the cervix. In 1894 Williams reviewed the literature on sarcoma of the uterus and reported 144 cases. In 1901 Knott reviewed 118 cases collected from the literature during the preceding ten years. In 1905 Grad called attention to the benefits derived from the radiotherapy of sarcoma of the uterus. Between 1907 and 1909 Taylor reported three cases of sarcoma of the uterus. Masson in April, 1923, reviewed the literature from 1894 to 1923 and reported 200 cases. Bunton reported nine cases from 1923 to October, 1925. This brings the number of cases reported up to October, 1925, to a total of 353 cases. From October, 1925, to the present date on reviewing the literature we have collected 39 cases of sarcoma of the uterus of which seven were mixed tumors.

We have had three cases of sarcomatous degeneration of fibromyoma and one case of an intramural sarcoma of the uterus. This brings the total number of sarcoma of the uterus to be reported in the literature to 396 cases.



Fig. 2.—Incipient sarcoma in fibromyoma of the uterus. Note the polymorphous and occasional giant nuclei.

The unusual feature of our case of intramural sarcoma from a clinical point of view was that lying close to the serous surface of the uterine wall it perforated into the abdominal cavity causing internal hemorrhage. Reviewing all the literature we have not been able to find any similar case on record. It will remain an open question whether radiotherapy applied in this case was responsible for the outcome; that is, for the breaking down of the center of the tumor and its perforation into the abdominal cavity with hemorrhage.

While cases of this type must be considered as extremely rare the so-called sarcomatous degeneration of fibromyomas seems to be so much more common. Among the 154 fibromyomas operated upon in the Koster Clinic during the last year there were three cases of sarcomatous degeneration. Two cases appeared to us as very early stages of the growth and were recognized during the routine examination

of the tumors. These fibroids were grossly not different from any of the other tumors and only microscopic examination revealed scattered areas of greater cellularity in which the densely packed nuclei were highly polymorphous and showed occasional mitotic figures.

Diagnosis of such incipient sarcomatous degenerations should be made with great care as areas of greater cellularity are very common in ordinary benign fibromyomas. A certain degree of polymorphism is also met with not infrequently in such tumors, particularly in the neighborhood of areas of liquefaction and other degenerative changes. They express necrobiotic changes rather than evidence of incipient malignancy.

The third case which we observed showed grossly a distinctly different behavior. The report of the case is as follows:

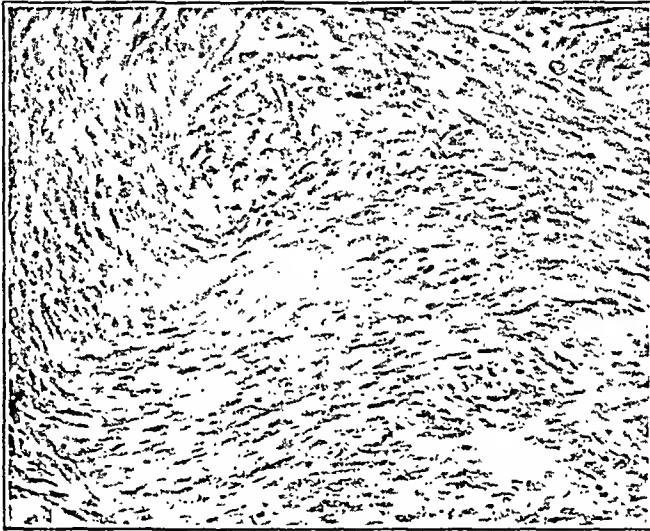


Fig. 3.—Sarcomatous changes in fibromyoma. The cells are densely packed with but little fibrillar stroma. The nuclei are irregular.

A female patient aged forty-seven was admitted into the hospital November 13, 1930. Patient's history revealed that for the last year her menstrual period which usually lasted three days became prolonged to eight days. She also had intermenstrual bleeding and a dragging-down pain in the pelvis. On examination a large mass was palpable in the lower abdomen and reached halfway up to the umbilicus. There was no fluid palpable in the abdomen, no points of tenderness. On vaginal examination the cervix was pointing posteriorly, uterus was enlarged to the size of a five months' pregnancy and was freely movable. Diagnosis of fibroid uterus was made. A laparotomy was performed and a large fibroid uterus was found. Right ovary was cystic and enlarged. Gall bladder showed the evidence of a chronic inflammation and contained stones. A supracervical hysterectomy, right salpingo-oophorectomy, appendectomy, cholecystectomy, and perineorrhaphy were performed under spinal anesthesia. Patient made an uneventful recovery. Discharged November 28, 1930.

The specimen showed a considerably enlarged uterus which was the size of the head of a newborn infant. It was globular but somewhat irregular in shape. On cutting the specimen in half a single globular tumor was found which was placed

intramurally, causing a subsequent distention and compression atrophy of the surrounding uterine tissue. The uterine cavity was eccentrically displaced and slightly distended and showed a somewhat thickened and shaggy mucosa. The tumor itself consisted of two portions. The main portion was firm and of a fibrillar structure with irregular whorl-like arrangement of the bundles. The other portion which was crescent-shaped separated the main tumor from the uterine wall. This portion was very soft, edematous, and contained many small irregular cystic cavities. A few larger fluid-filled spaces were also found. The gross inspection of this tumor aroused our suspicions as to its malignancy by the following facts:

1. The deeper yellow color of the main tumor.
2. The very irregular arrangement of its bundles.
3. The relative softness of this tumor as compared to other solid fibromyomas.

The extensive degeneration of the outer crescent-shaped portion of the tumor also pointed to a more rapid growth of the inner portion causing a successive compression and lymph-stasis of the section not involved in the secondary malignant proliferation.

Histologic examination revealed a tumor similar in its architecture to an ordinary fibromyoma, yet of enormous cellularity. The nuclei of these cells were densely packed and their size and shape were very irregular. Their chromatin content was increased. Mitosis was occasionally met with. In the less dense areas the relationship of the nuclei to the fibrils could be studied and ascertained and showed the characteristics of smooth muscle cells. The staining of the fibrils also indicated that the tumor was essentially a leiomyosarcoma as the fibrils with little exception did not stain well with eosin or acid fuchsin.

Section stained with Mallory's aniline-blue-orange mixture showed the presence of quite numerous blue-stained fibrils even in the most cellular areas of the tumor. Yet many other fibrils in the same or in other places did not take the blue stain disclosing their nonecollagenous nature. It would seem that the cells of this tumor are of a double nature inasmuch as they are derived from a double matrix. Part of the cells are derived from smooth muscle tissue while others descend from fibroblasts. The double nature of these cells can be verified only on the more matured individuals which were capable of forming fibrillar substances.

Comparing this case of advanced sarcomatous degeneration of fibromyoma with slides from the more incipient cases we cannot exclude the possibility that there is a component in the sarcomatous growth which is derived from fibroblasts.

TABLE I. STATISTICAL DATA

MYOMA EXAMINED BY	TOTAL NO.	SARCOMA NO.	PER CENT
Evans	4000	72	1.8
Kelly and Cullen	1400	17	1.2
Berreiter	716	6	0.83
Williams	4115	8	0.19
Tracy	3561	54	1.5
Gurlt	4115	8	1.8
Noble	2274	34	1.4
Von Franque	3366	16	0.47
Gessner	9133	18	0.19
Veit	42395	40	0.09
Vogt	1216	30	2.37
	72116	300	0.41

Comparing the various statistics published in the last fifteen years of sarcomatous degeneration of fibromyoma we arrive at an average figure of 0.41 per cent. The estimate percentages of the individual

authors vary from 0.09 to 2.37. (See Table I.) This would indicate that the frequency of sarcomatous fibromyomas increases with the care taken at histologic examination of the specimens. The collection of over 42,000 cases in which only 40 sarcomas were found (0.09 per cent) makes us believe that some were overlooked. The remaining 30,000 cases with 260 sarcomas bring the average figure close to 1 per cent. This figure compares better with our observations of three sarcomas in 154 cases (close to 2 per cent) and would emphasize the importance of careful examination of any uterine fibroid tumor removed.

SUMMARY

Four cases of uterine sarcoma are reported, one of which is a primary intramural sarcoma, perforating into the abdominal cavity and causing internal hemorrhage. The other three cases show gradations of sarcomatous degeneration of fibromyoma.

The relative frequency and importance of sarcomatous degeneration in uterine fibromyomas is emphasized.

REFERENCES

- Andrews, H. R.*: Proc. Roy. Soc. Med. 14: 324, 1921. *Azzola, F.*: Zentralbl. f. Gynäk. 48: 2285, 1924. *Buntin, J. C.*: Surg. Gynec. Obst. 41: 477, 1925. *Centroni, B. M.*: Clin. Obstet. 29: 103, 105, 1927. *Dannreuther, W. T.*: J. A. M. A. 91: 1532, 1928. *Evans, N.*: Surg. Gynec. Obst. 30: 225, 1920. *Frankl, O.*: Arch. f. Gynäk. 122: 554, 1924. *Gardner, L. U.*: J. Med. Research 36: 19, 1917. *Geisler, W.*: Arch. f. Gynäk. 128: 452, 1926. *Gerich, O.*: Zentralbl. f. Gynäk. 53: 2016, 1929. *Grad, H.*: Am. J. Obst. & Dis. Women 51: 599, 1905. *Grave, W. P.*: Gynecology, Philadelphia and London, W. B. Saunders & Co., p. 345. *Hanvick, R. A.*: Proc. Staff Meeting, Mayo Clinic 4: 5, 1929. *Hinterstoissen, H.*: Zentralbl. f. Gynäk. 44: 270, 1920. *Imhauser, K.*: Arch. f. Gynäk. 123: 12, 1924. *Jacquin, P.*: Gynec. & Obst. 3: 90, 1921. *Kaufman, E.*: Pathology, Vol. III, Philadelphia, P. Blakiston's Son & Co., p. 1668. *Kelly*: Gynecology, New York and London, D. Appleton & Co., p. 608. *Mac Callum, W. G.*: Pathology, Philadelphia and London, W. B. Saunders & Co., p. 975. *Masson, J. C.*: AM. J. OBST. & GYNEC. 5: 345, 1923. *Miller, R. H., and Rogers, H.*: Trans. New England S. Soc. 10: 235, 1928. *Mouलगonguet, P., and Dobkevitch, S.*: Bull. Soc. d'obst. et de gynec. 19: 25, 1930. *Reel, P. J., and Charlton, P. H.*: Ann. Surg. 77: 476, 1923. *Sage, E. C., and Miller, A. G.*: AM. J. OBST. & GYNEC. 16: 828, 1928. *Stein, I. F.*: S. Clin. North America 7: 771, 1927. *Steinhardt, B.*: Wien. klin. Wochenschr. 37: 844, 1928. *Stout, A. P., and Corscaden, J. A.*: Am. J. Roentgenol. 21: 155, 1929. *Vertes, O., and Zacher, P.*: Ztschr. f. Geburtsh. u. Gynäk. 70: 171, 1912. *Vogt, E.*: Fortschr. a.d. Geb. d. Röntgenstrahlen 35: 44, 1926. *Vogt, M. E.*: AM. J. OBST. & GYNEC. 5: 523, 1923.

NORMAL PREGNANCY IN A PATIENT WITH PREEEXISTING COMPLETE HEART-BLOCK

BY R. S. TITUS, M.D., AND WILLIAM B. STEVENS, M.D.,
BOSTON, MASS.

THE case to be described is reported because of the rarity of records of the occurrence of childbirth in patients with preexisting complete heart-block. When the patient under consideration requested that she be allowed to become pregnant, we could locate published reports of only four similar cases that had been permitted to go through to full term.

In 1927 Jeannin and Clerc¹ reported a case with a 2-1 heart-block and occasional attacks of vertigo and faintness who went through pregnancy spending the last two months in bed, and after twelve hours of labor was delivered by vaginal cesarean section. The circulatory efficiency was normal during labor and nine months later examination showed no evidence of further cardiac damage. In a discussion of this case a similar instance was mentioned by M. Laubry.² Again, in 1927,³ two cases of pregnancy with heart-block were reported from Germany. The first patient was in labor twenty-three hours with a rise in ventricular rate from 36 to 52 per minute and a drop to between 40 and 50 after spontaneous delivery. Four years later this patient showed no evidence of damage to the heart, and the left border as detected by x-ray examination was 9.5 cm. to the left of the mid-sternal line as compared to 10.2 at the beginning of the pregnancy. The second case of complete heart-block with diphtheritic etiology was delivered of an eight months' premature infant without difficulty. Examination of the mother four months after labor showed the cardiac function to be competent. The left border of the heart was 9.5 cm. from the midsternal line; and complete heart-block was verified by means of an electrocardiogram. In various surveys of the condition of the heart in pregnancy by James McKenzie,⁴ Wilson et al.,⁵ and in obstetric textbooks, no mention is made of patients with preexisting complete heart-block who have become pregnant. Recently⁷ a patient with complete heart-block who had six deliveries without incident has been mentioned briefly in a survey of the heart in pregnancy. We feel that the coincidence cannot be as rare as would appear from the literature, especially since heart-block in young people⁶ is recognized as being not especially unusual.

On the basis, then, of the above cited cases with uneventful delivery, the patient reported here was allowed to become pregnant after both she and her husband understood that the risk was greater than in a normal person.

L. B., a minister's wife, twenty-five years old, first consulted Dr. F. Gorham Brigham* in 1925 because of easy fatiguability and nervousness. Her parents both died of unknown cause before she was nine years old, so that she knows very little of her early medical history. There is no evidence that she had diphtheria or any other severe infection in childhood. At the age of twelve years casual examination

*We are indebted to Dr. F. Gorham Brigham for the use of his records and valuable supervision throughout the course of the case.

by a physician showed that she had a "very slow pulse." She had no symptoms referable to her heart, however, until at the age of nineteen years when she suddenly fainted while playing field hockey, and later was told she almost died. She refrained from competitive sports, but after graduation from college worked hard as a social worker, and at the age of twenty-two years was married. She has carried her full share of the mental and physical load that her position as minister's wife in a large rural church demands. In the summer of 1927 she climbed a mountain of 3,000 feet within three hours, without any particular difficulty. Her past history is otherwise irrelevant.

During the period of preliminary observation from 1925 to 1928, she exhibited symptoms referable to the heart only when tired. On such occasions she had a sense of heaviness in the precordium and rarely short stabbing needle-prick pains localized in this region. More rarely, when especially tired, she experienced a momentary dizzy feeling, but did not lose her balance or consciousness. There has been no dyspnea; rarely a moderate palpitation; no edema; and no failure of the cardiac compensation.

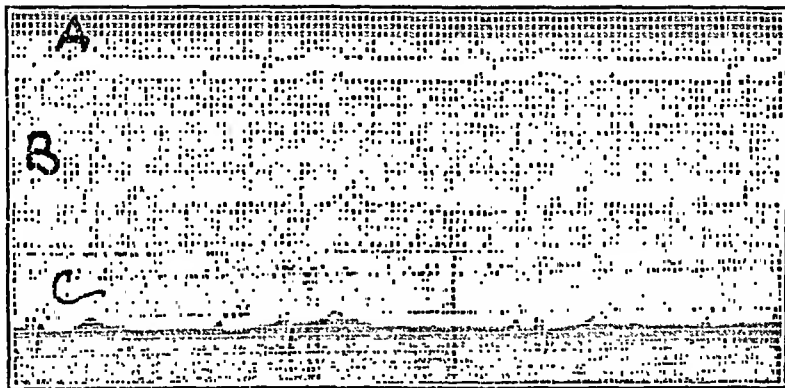


Fig. 1.—Lead I. Time marker $1/5$ sec. Complete auriculoventricular dissociation. A. June 15, 1925. Three years before pregnancy. B. March 21, 1929. Nine days before delivery. C. June 27, 1929. Three and one-half months after delivery.

Physical examination in 1928 showed a sensitive, tall, rather thin woman who looked the picture of health. Aside from her rather small physique, the physical examination was negative except for the heart which was slightly enlarged. The apex was seen and felt in the 5th intercostal space 9.5 cm. from the midsternal line, and the left border of dullness corresponded to the same area. The right border was 3 cm. from the midsternal line and supracardiac dullness was 5.5 cm. in width. The cardiac rate was 44 per minute, with slight sinus arrhythmia. The heart sounds were of good quality. The auricular sounds were not discernible. There was a harsh, loud, rather musical systolic murmur heard best at the apex but present all over the precordium. The systolic blood pressure was 110 mm. of Hg and the diastolic was 70 mm. of Hg.

The Wassermann test of the blood was negative. An analysis of the urine revealed no abnormal findings on several examinations. There was a moderate degree of "secondary anemia." The hemoglobin content of the blood remained between 65 and 75 per cent by the Tallquist method.

The electrocardiograms (Fig. 1) in 1925 and 1928 showed complete auriculoventricular dissociation, and a seven-foot roentgen-ray plate of the heart showed essentially no enlargement (Table I).

TABLE I. MEASUREMENTS FROM ELECTROCARDIOGRAM AND SEVEN-FOOT X-RAY PLATE OF HEART

DATE	VENTRICULAR RATE PER MINUTE	AURICULAR RATE PER MINUTE	LEFT BORDER CM.	RIGHT BORDER CM.	TRANS- VERSE CM.	LONG DIA. CM.	BASE CM.	GREAT VESSELS CM.	CHEST CM.	CHEST TRANSVERSE PER CENT
6/15/25	44	73	7.7	4.1	11.8	12.3	8.4	5.6	21.9	53
12/ 8/27	45	68	7.5	4.2	11.7	13.0	9.3	5.5	21.5	54
9/ 6/28	45	75	7.7	4.4	12.1	13.2	9.8	5.7	21.8	55
10/11/28	50	78	6.5	4.3	10.8	12.5	10.1	6.0	21.7	50
11/15/28	58	82	8.0	3.9	12.9	12.4	9.1	6.2	22.4	58
12/14/28	50	72	8.6	4.4	13.0	13.8	10.5	6.5	22.7	57
1/31/29	54	88	8.7	4.1	12.8	13.5	9.8	6.0	23.7	54
3/ 6/29	53	76	9.0	4.3	13.3	14.3	9.6	6.0	24.3	55
3/21/29			8.5	5.4	13.9	14.5	9.9	6.1	24.0	58
6/27/29	38	57	7.6	4.4	12.0	13.2	8.7	6.0	21.9	55
11/21/30	38	60	7.3	3.7	11.0	13.5	10.2	5.9	22.3	49

The patient missed her first menstrual period in July, 1928. She was admitted to the New England Deaconess Hospital, August 20, 1928, with a threatened miscarriage, and was in bed for ten days when the flowing stopped. She then went home and rested. During this time obstetric supervision was first undertaken. She returned to the hospital once a month during her pregnancy and stayed each time for twenty-four hours. She was examined and weighed. A twenty-four hour urine analysis was made, and an electrocardiogram and seven-foot plate of the heart with fluoroscopic examination were obtained at each visit.

Certain observations relating to the heart during pregnancy are shown by the measurements in Table I. At no time were there any serious symptoms referable to the heart. The patient gained weight slowly, her systolic blood pressure remained between 120 and 130 and the diastolic between 70 and 80. There was a slight increase in the rate of both the ventricles and auricles as is shown in Table I. When the patient first entered the hospital the ventricular rate was often 10 beats per minute higher than that shown after she had relaxed and the electrocardiogram could be taken. Toward the end of December she became somewhat over-tired and complained of palpitation and a sense of constriction in the pre-cordium toward the end of the day. Following this visit she took a period of rest after lunch every day, went to bed by 9:30 o'clock, and often had breakfast in bed. At her next visit all the cardiac symptoms had disappeared and they did not recur. On March 20, 1929, she was admitted to the hospital to stay at rest until she went into labor. Examination during this period showed the cervix entirely obliterated, very soft, and the head well engaged. She was therefore allowed to go into normal labor which she did after spontaneous rupture of the membranes at noon, March 31. At 3 P.M. she was having unsatisfactory pains and was given subcutaneously two minims of "infundin." Labor started satisfactorily and continued until 4:30 P.M. when the pains let up somewhat and she was given two more minims of "infundin." Inhalation of nitrous oxide was started as an analgesic at this time. At 5:30 P.M. the head was in sight, and under ether anesthesia, a low forceps delivery was done.

The child was normal in every way and cried immediately. During labor the patient's pulse reached a maximum rate of 76, was of good quality, and the patient was warm and pink. The cardiac rate dropped to 60 immediately after delivery and to 44 at the time of her discharge from the hospital three weeks after the baby was born. Convalescence was normal. The patient has taken entire care of the baby with help for the heavy house work only. She is doing more and more work in the church without any cardiac symptoms. Examination of the heart one year and eight months after delivery shows the auricular and ventricular rate to be the same as before pregnancy, the size by x-rays and percussion to be essentially the same. The heart sounds are of good quality, the loud systolic murmur still present but not changed in intensity or type.

DISCUSSION

The progress from the cardiac point of view is best seen from Table I and Fig. 1. It will be seen that there was a slight rise in both auricular and ventricular rates (as shown by the electrocardiogram) during pregnancy. Following delivery there was a drop in both the auricular and ventricular rates. There was also during pregnancy a gradual increase in the transverse and long diameters of the heart as measured from the seven-foot heart plates, all of which were taken by the same machine and as nearly as possible under the same conditions. How-

much of this apparent enlargement was due to pushing up of the chest viscera by the fetus is difficult to determine, but a gradual increase in the chest diameter can be seen, especially in the later months of pregnancy. The percentage relation of the transverse diameter of the heart to the diameter of the chest has been computed (in the last column of Table I) as the simplest expression of any true enlargement of the heart. There was comparatively little change in this value, there being only a 4 per cent increase from 54 per cent six months before becoming pregnant to 58 per cent two weeks before delivery.

The patient stood labor well. There was no evidence of myocardial insufficiency, and the small doses of pituitrin given to improve the strength of uterine contractions caused no change in the blood pressure or heart rate. Examination and tests three, six, and twenty-two months following delivery including history, physical examination, heart plates, and electrocardiograms gave no evidence that the efficiency of the heart was reduced by this experience.

We feel, therefore, that a patient with complete heart-block having no demonstrable myocardial insufficiency or changing block may be allowed to go through a carefully supervised pregnancy. The question of the method of delivery is one which cannot be answered until the end of pregnancy and depends upon the condition of the cervix and the height of the presenting part. If, as in this case, the cervix is very soft, entirely obliterated, and admits one finger, with the head very well engaged before labor, it seems that normal labor is not only safe but conservative. On the other hand, if the cervix is not taken up, is not well softened, and the head is not well engaged, so that labor would probably be long drawn out, cesarean section might well be considered the operation of choice.

SUMMARY

A case is reported of a patient with preexisting complete heart-block, who went through pregnancy and a normal labor without showing evidence of any decrease in cardiac function.

REFERENCES

- (1) *Jeannin, A., and Clerc, C.*: Bull. et mém. Soc. méd. d. hôp. de Paris 51: 122, 1927. (2) *Ibid*: p. 126. (3) *Dressler, W.*: Wein. Arch. f. inn. Med. 14: 83, 1927. (4) *McKenzie, J.*: Lancet 1: 1163, 1921. (5) *Wilson et al.*: AM. J. OBST. & GYNEC. 13: 617, 1927. (6) *White, P. D., and Sprague, H.*: M. Clin. North America 10: 1235, 1927. (7) *Herrmann, G., and King, E. L.*: J. A. M. A. 95: 1472, 1930.

TWO YEARS RÉSUMÉ OF ABORTIONS IN THE LOUISVILLE CITY HOSPITAL*

By W. O. JOHNSON, M.D., F.A.C.S., LOUISVILLE, KY.

(From the Department of Gynecology, University of Louisville Medical School)

IN THE following cases of abortions treated in the Louisville City Hospital between October 1, 1927, and October 1, 1929, we wish to bring out the frequency of abortions, and present the methods used in the gynecologic department in dealing with these conditions. This series of abortions is not comparable to the previous report made in the *Kentucky State Medical Journal*.

The 329 cases analyzed are divided into, threatened abortions, 41 cases, and incomplete abortions, 288 cases. The classification is made upon diagnosis after complete examination. In all of the cases the initial cause of the abortion began outside the hospital, and patients were either sent or came to the institution for treatment.

The percentages given are based on the total number of cases in each group.

In the group of threatened abortions, such signs in a normal pregnant person as slight flow, backache, or low pelvic pain, indicated the need of attention and are included here.

There were 41 cases in this group; 9.7 per cent of these completed the abortion after entering the hospital.

Among the cases of threatened abortions twenty-four years was the average age, seven the average hospital days, 87.8 per cent of the cases were said to be married, 21.1 per cent admitted being single, and 7.3 per cent intimated that they were divorced. Among those who had borne children, $3\frac{1}{2}$ was the average number of children, and $3\frac{1}{4}$ the average number of previous abortions. Twenty-one and nine-tenths per cent of the cases admitted that the abortion was induced, and 7.3 per cent stated that the induction was started by a doctor.

TABLE I

CAUSE OF ABORTION	THREATENED ABORTION 41 CASES		INCOMPLETE ABORTION 288 CASES	
	CASES	PER CENT	CASES	PER CENT
Induced	9	21.9	63	21.8
Jar, fall, strain	6	14.6	46	15.9
Medicines	2	4.8	29	10.0
Catheter	2	4.8	23	7.98
Malposition	—	—	6	2.0
Physician	3	7.3	25	8.68
Cause unknown	19	46.03	96	33.33
Total	41	99.43	288	99.69

*Read before the Louisville Obstetrical and Gynecological Society, January 27, 1930.

Fourteen and six-tenths per cent of the cases attributed the onset to a fall, jar or unusual strain. Four and eight-tenths per cent of the cases used medicine, and a similar number resorted to vaginal packs.

The average duration of symptoms before entering the hospital was twelve days, estimating from the onset of bleeding to the date of entrance into the hospital. In 75.6 per cent of the cases bleeding was the first symptom, while 87.8 per cent of the patients complained of abdominal cramps, and 39.0 per cent had the usual nausea and vomiting associated with pregnancy. Only 2.4 per cent of the patients in this series had chills and fever, and with one exception all patients with chills and fever occurred in those where abortions had been induced.

Upon physical examination, lower abdominal tenderness was present in 56.0 per cent of the cases, and 54.6 per cent the uterus was large enough to be palpable through the abdominal wall. Twenty-three and four-tenths per cent had leucorrhœal discharge. The estimated average duration of pregnancy was two and one-half months. There was no mortality.

TABLE II

	THREATENED ABORTIONS		INCOMPLETE ABORTIONS	
	CASES	PER CENT	CASES	PER CENT
White	30	73.1	239	82.9
Colored	11	26.8	49	17.0
L.O.A.	11	26.8	76	26.3
Readmitted	5	12.1	18	6.25
Previous spontaneous labors	4	9.75	51	17.1
Previous forceps deliveries	—	—	4	1.38
Previous cesarean section	—	—	3	1.04

The treatment in this group was absolute rest in bed, with the foot of bed elevated in 46.3 per cent of the cases. The patient was not allowed to move out of bed until she was free from symptoms for at least forty-eight hours. For the relief of pain, restlessness, and irritability, opiates were given in sufficient quantity to keep the patient quiet and comfortable. Morphine was used in 82.9 per cent of cases and codeine in 24.3 per cent; in some cases both drugs were used. The diet was simple, with little residue, fluids were urged, and the bowels were regulated with mineral oil or milk of magnesia. In 26.4 per cent of the patients ice-caps were applied to the abdomen. All vaginal discharge was carefully examined and no vaginal examination or manipulations were attempted. This outline was continued for forty-eight hours after the cessation of the symptoms, then the patient was allowed to resume slowly her usual activity and advised to avoid the conditions which had brought on the previous condition. Pelvic examinations were not made for seven to ten days after the symptoms had subsided.

This conservative supporting treatment is sufficient to bring about a satisfactory quiescence in cases of threatened abortion, but there are other types, such as deficient germ plasm or other abnormal conditions, which do not yield to the treatment outlined above. There are numerous symptoms by which these graver conditions may be recognized. If a hemorrhage occurs that is sufficient to soak five napkins in twenty-four hours, or if one lasts for several days, severe enough to prevent recovery of blood supply, as can be shown by blood count or hemoglobin determination, and subjective feeling of the individual, or if the patient has a characteristic rhythmic sharp pain in the lower pelvis or back which is not relieved by moderate doses of morphine, and if, in conjunction with any or all of the above, there is a rupture of the membranes, we may consider that we have an inevitable abortion.

TABLE III

DILATATION AND EVACUATION 29 CASES			
Duration of symptoms	28.1 days		
Hospital days prior to dilatation and evacuation	3.9 days		
Placental and remnants found	29 cases	100 %	
Blood clots	8 cases	27.5%	

The incomplete abortions number 288 cases. The average age was 25.7 years, with 9.8 average days of hospitalization. Seventy-nine and five-tenths per cent admitted they were married, 14.5 per cent were single, and 0.48 were said to be divorced. The average number of pregnancies in this group is four, with $2\frac{3}{4}$ the average number of previous abortions.

Twenty-one and eight-tenths per cent admitted that the abortion was induced, and 0.86 per cent stated that a doctor had started it. Sixteen per cent induced the abortion by taking medicines, and 14.2 per cent attributed the onset to a fall, jar or strain, and only 7.3 per cent had malposition of uterus to account for the condition. (Table II.) In this group the duration of symptoms averaged twenty-eight and one-tenth days. Vaginal bleeding was the first symptom in 79.1 per cent of the cases, abdominal cramps in 59.7 per cent of the cases, and passage of clots from the vagina in 43.4 per cent. The fetus was said to have been passed in 64.2 per cent of the cases before entrance into the hospital. Chills and fever were present in 13.1 per cent of the cases, and in every such instance, the abortion had been induced.

Upon physical examination 59.0 per cent had low abdominal tenderness. The uterus was palpable in 40.2 per cent of the cases; 10.4 per cent of the cases had positive Wassermann, and 25.0 per cent of the cases had albumin in the urine.

In 49.6 per cent the placenta was expelled after entering the hospital, and only in 16.6 per cent were the fetus and placenta expelled.

The average duration of pregnancy in this series was estimated to be four months, and the estimated average age of the fetus examined was three and one-half months.

Twenty-four and three-tenths per cent of the cases had a temperature of 99°-100° when they entered the hospital; among these, 34 per cent were patients who had induced their abortions: in the 26 per cent who had a temperature of 100° or over, 56 per cent had induced their abortions.

TABLE IV

INFECTED ABORTIONS	THREATENED ABORTIONS 41 CASES		INCOMPLETE ABORTIONS 288 CASES	
	CASES	PER CENT	CASES	PER CENT
Chills and fever	1	2.43	38	13.1
Temperature 99° to 100°	13	31.7	70	24.3
Temperature 100° to 104°	5	12.1	75	26.0
Number of induced	9	21.9	63	21.8

When the abortion is inevitable or incomplete the treatment differs from that outlined for threatened abortions. As the figures show, over 50 per cent of the patients entered the hospital with fever, and we know that every febrile abortion is potentially a serious condition which should be treated in a hospital.

After the patient enters the hospital systemic treatment is instituted at once including absolute rest, fresh air, forced feeding of a high calorie, low residue diet; the fluid intake is kept to 2000 c.c. day, or hypodermoclysis may be resorted to, and blood transfusion is given without hesitancy if desiccation or anemia is present.

The initial examination is made very cautiously and if there is definite evidence of complications outside of the uterus, even so slight an indication as abdominal tenderness, strict conservatism is observed, and the following treatment is directed toward the resulting complications and not the abortion.

TABLE V

MISCELLANEOUS DATA	THREATENED ABORTIONS 41 CASES		INCOMPLETE ABORTIONS 288 CASES	
	24 years 7		25.7 years 9.8	
Average age				
Hospital days				
Married	36 cases	87.8%	232 cases	80.5%
Single	5 cases	12.1%	42 cases	14.5%
Average pregnancy	3½		4	
Average abortion	3¼		2¾	
Duration of symptoms	12 days		28.1 days	
Initial symptom bleeding	31 cases	75.6%	228 cases	79.1%
Passage of fetus	6 cases	14.6%	185 cases	64.2%
Duration of pregnancy	2½ months		4 months	
Wassermann	5 cases	12.1%	30 cases	10.4%
Albumin	15 cases	36.5%	73 cases	25.0%

If upon speculum examination, under sterile precautions, we see remnants protruding from the dilated cervical os, they are gently

removed with placental forceps. The patients are given one-half c.c. of pituitrin every half-hour for six doses and at the completion of this course one drachm of fluid extract of ergot is given every four hours for four doses. Under this régime a severe hemorrhage seldom occurs, and it is rarely necessary to pack the vagina. In fact, the vagina is never packed except in rare and extreme cases of profuse bleeding, and this only long enough to tide over an acute emergency until the pituitrin and ergot have acted. Even if the bleeding continues and the membranes are not completely expelled, a dilatation and evacuation is not considered until the temperature has been normal for three days, and then under the most rigid aseptic operative technic. Hegar dilators are used to dilate the cervix, and, with an iodine sponge wrapped on dressing forceps the uterine cavity is swabbed out. With sterile gloved finger the uterine cavity can usually be examined with ease to detect any remnant of tissue. Forceful dilatation and rough handling with hands is contraindicated. After dilatation and evacuation the uterus is kept in contraction by ergot, and the iodine sponge is left in the cervix for twenty-four hours. With this routine there has not been a death from dilatation and evacuation, in the past two years, and in only 10 per cent of all these cases was dilatation and evacuation necessary.

There were three deaths in this series of 288 cases, or a mortality of 1.4 per cent. Two deaths occurred from septicemia, and one patient, entering the hospital almost moribund, died from hemorrhage.

SUMMARY

1. A more careful study of the products of conception together with an accurate knowledge of maternal conditions will aid in preventing a great number of abortions.

2. Induced abortions are rapidly increasing in number and are associated with a high morbidity and numerous complications which greatly impair the health of the individuals.

3. Threatened abortions should be handled most conservatively and no manipulation or packing instituted.

4. Conservative treatment of inevitable and incomplete abortions has proved most satisfactory in our hands. Only 10.0 per cent of the cases needed surgical intervention, and this was resorted to only after conservative measures had failed.

5. Septicemia was the cause of 66.6 per cent of the deaths in this series, 95 per cent of the infected cases were the result of induced abortions.

The public should know the grave dangers and complications resulting from induced abortions. A fuller understanding of the great risks involved would mean consideration and hesitation before the attempt is made.

BALDWIN MODIFICATION OF THE JARCHO PRESSOMETER FOR TRANSUTERINE INSUFFLATION, PNEUMOPERI- TONEUM AND UTEROSALPINGOSTOMY

BY L. GRANT BALDWIN, M.D., PASADENA, CALIF.

(Formerly Instructor in Obstetrics and Gynecology, University of Michigan)

THE intent of this article is to describe a modification of several preexisting instruments which will serve equally as well for Rubin tests, injections of opaque media and pneumoperitoneum. More specifically, it is a combination of a

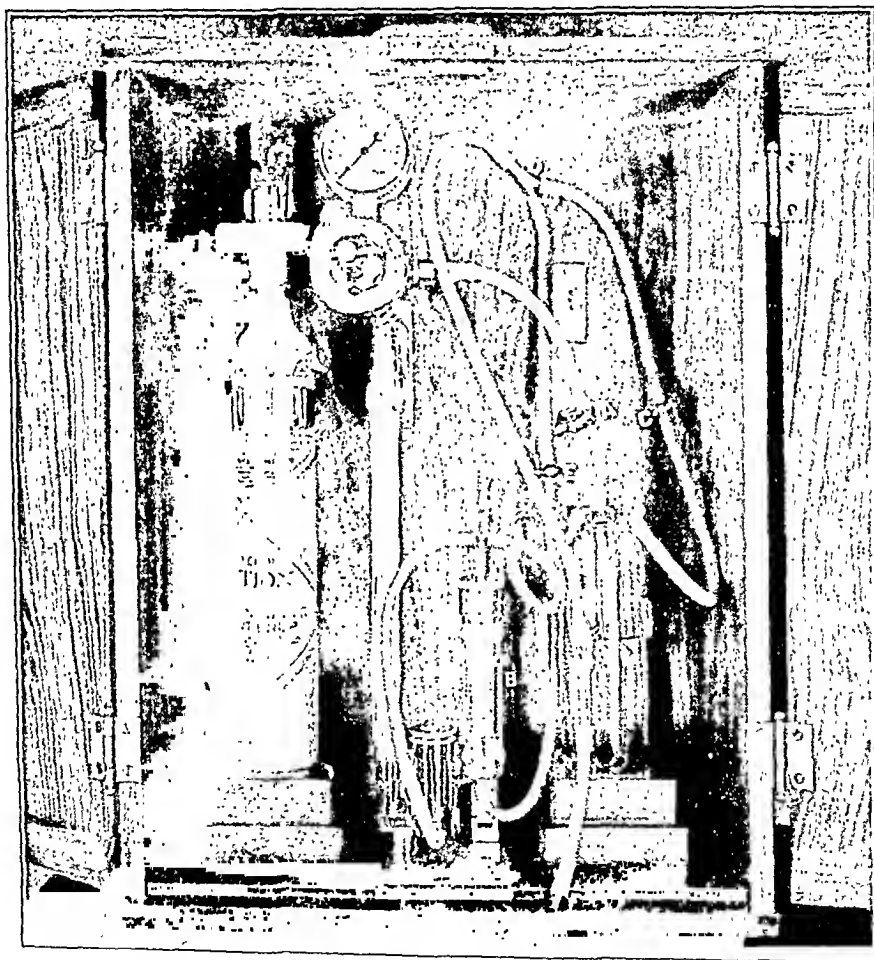


Fig. 1.

flow volumeter, a manometer and a cylinder for containing the opaque media. All of these units are familiar and have been fully described by others.

This particular arrangement was evolved in the Department of Obstetrics and Gynecology of the University of Michigan, in April, 1930. As is so often the case, a very similar hook-up was described several months before by Jarcho, over which we claim no priority although working without knowledge of his apparatus.

The instrument (Fig. 1) consists of a carbon dioxide cylinder which is connected with a Machlett siphonmeter. This in turn is connected with a Jarcho Pressometer, as made by Becton Dickinson and Company. These instruments are connected in such a way that they form a unit which can be used for either gas insufflation, pneumoperitoneum, or the injection of opaque media, singly or combined.

The carbon dioxide is used for pressure in all cases. The arrangement is shown in Fig. 1. The gauge and mixing valve connected with the gas tank controls the amount of gas delivered to the siphonmeter, which is further controlled by a Hoffmann clamp *A*. One outlet from the siphonmeter leads directly to the inlet of the lipiodol container *B*. The other outlet is equipped with a stopcock *C* and Y tube *D* and then leads to the patient. The opposite arm of Y tube *D* is connected with the lower end of the lipiodol chamber and is also equipped with a stopcock *E*. Adapter *F* is connected with a uterine cannula when in use. In the figure the Y tube is fastened to the back of the cabinet only for photographic reasons. As used, it is free.

In using the apparatus for gas insufflation, stopcock *C* is opened and *E* is closed; with this arrangement the gas passes through the siphonmeter and to the patient. The pressure is registered on the manometer. For the use of an opaque media, stopcock *E* is opened and *C* is closed. With this change the gas passes into the cylinder *B* and forces the opaque media toward the patient. This pressure is also registered on the manometer. It will be seen that the entire system, from cylinder *B* to adapter *F*, should be filled with the opaque media before the adapter is connected to the cannula, especially if the tubes are closed; otherwise the uterus will be filled with the air present in the tubing leaving no room for the opaque media and causing considerable pressure.

It is believed that this apparatus simplifies the procedures undertaken, and at the same time gives one a definite knowledge of the pressure exerted at all times. The entire apparatus is contained in a portable cabinet weighing twenty-one pounds and measuring $19\frac{1}{2}$ inches in height, $14\frac{1}{2}$ inches in width, and $7\frac{1}{2}$ inches in depth.

595 E. COLORADO STREET.

Society Transactions

THE AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-SIXTH ANNUAL MEETING

Hot Springs, Va.

MAY 18, 19, AND 20, 1931

The following papers were presented:

1. **The Preoperative and Postoperative Effect of Intravenous Glucose Solutions on the Cardiovascular Apparatus and Upon the Cellular Contents of the Blood**, by Dr. John O. Polak, Brooklyn, N. Y. (To be published later.)

ABSTRACT OF DISCUSSION

DR. HENRY T. HUTCHINS, BOSTON, MASS.—Dr. Polak has supplemented clinical data on glucose administration by an investigation into the physiologic action. We must get even more data from such investigations and from the physiologists who should tell us what strength we can use and what the actual physiologic reaction is. We started in first using glucose by rectum, then followed with the dilute solutions by vein, and now Dr. Polak wants us to push it up to a 50 per cent hypertonic solution in the vein.

I wish Dr. Polak had said more about the action of glucose in severe infections. We all recognize the value of their use. One of my colleagues had a case of general streptococcic septicemia, involving all the joints, following a ruptured appendix and general peritonitis. Glucose was given in that case, in 20 per cent solution, 500 c.c. by vein every other day for a period of well over a month. On the days on which the glucose was given the blood culture was negative to streptococci and on the alternating days it was positive. The patient recovered and we attributed part of the recovery to the glucose.

There are three fundamental uses for glucose. First, it is a food, therefore its use in preoperative and postoperative cases. Second, it is a carbohydrate, therefore its use in abating postoperative vomiting and the acidity of intestinal obstruction, shock, etc. Third, it will decrease the clotting time in jaundice, in gall bladder disease and disease of the ducts with dysfunction of the liver.

I believe in the use of insulin. Glucose will do no good unless it is oxidized. In cases of gall bladder disease and in cases where the pancreas is not acting insulin should be given in addition to the glucose.

DR. GEORGE GRAY WARD, NEW YORK CITY.—We have been using at the Woman's Hospital intravenous injections of glucose and gum acacia for a number of years, as brought out by Dr. Farrar before this Society. We have used a 20 per cent solution of glucose combined with a 6 per cent solution of gum acacia in many hundreds of cases and we have no cause to fear any untoward result from its use. Sir William Bayliss in London was the one who first showed the value of gum acacia in maintaining pressure and keeping the fluid in the vessels instead of having it seep out as it does with the ordinary saline solution given intravenously,

and as a result this work was taken up by Dr. Farrar and a clinical study carried out at the Womau's Hospital.

It is our custom in serious cases to give the intravenous solution during the operation and if necessary before and afterward. The technique of the administration is important. To prevent a reaction it is essential to give it slowly at the rate of 4 c.c. per minute, and at the temperature of 105° F., checked by a thermometer placed in the tubing. When properly given we have very rarely had any chill or reaction following. The quantity given is from 200 to 300 c.c., according to body weight. There can be no doubt that it is of very great value, especially aiding postoperative convalescence. In the avoidance of shock following a serious operation it has been a very valuable agent in our hands. The difficulty of preparing the gum acacia is considerable. We have been fortunate in having an English firm at Liverpool, with a New York agency, prepare it very satisfactorily for us and at a reasonable cost.

PROFESSOR E. C. DODDS, LONDON, ENGLAND.—I was interested and surprised to hear that glucose is given preoperatively intravenously to patients as a routine. It would appear difficult to understand the rationale for this when one considers that the majority of patients are capable of taking glucose by mouth. In England I have had considerable experience in treating patients who had diabetic coma, many of whom had been neglected in their earlier treatment before coming to the hospital. In these patients the clinical picture resembles a patient after a severe operation: the pulse is uncountable usually and they present an appearance of "dehydration." Our custom is to give such patients intravenous saline of double strength very slowly. As Dr. Ward has pointed out, the slowness is of the utmost importance. I should like to raise the point as to whether the beneficial effects of the intravenous treatment described by Dr. Polak are due to the fluid given intravenously or to the high glucose content causing water to be retained in the circulation.

With regard to insulin, I think one is on very dangerous ground when employing this for nondiabetic patients. After all, the action of insulin is not understood completely and we are not certain as to the effect it will have upon nondiabetic patients. Again, apart from diabetes mellitus there is no definitely proved disturbance of the internal secretion of the pancreas.

Finally, one would have expected 50 per cent glucose solution to cause severe damage to the vein wall and possibly thrombosis.

DR. CARL H. DAVIS, MILWAUKEE, WIS.—One advantage of the 50 per cent hypertonic solution is that it is given with a glass syringe without the use of rubber tubing. We have found in a careful investigation of so-called glucose reactions that almost invariably it was possible to demonstrate that the rubber tubing had deteriorated. We now only use the rubber tubing on the glucose apparatus a limited number of times because the tube will deteriorate just as rubber gloves do. If you will take and open up the tubing, you will find that the interior of the tube is very brittle.

It is probable that the so-called glucose reactions are after all a foreign body reaction and not due to the glucose solution. I have a feeling that oftentimes glucose has been used to the exclusion of other solutions where it would have been better to use salt solution. I suppose Dr. Polak has a recommendation in his paper for the 3 per cent salt solution with the glucose. We think that is very often better than using the straight glucose. Furthermore, I believe with Dr. Hutchins that the use of the solution with insulin has a definite place in some pregnant cases. The

acetone and diacetic acid disappear more quickly if we use insulin. We have had considerable experience with glucose and insulin and have seen no ill-effects. The hypertonic 50 per cent solution has one great advantage in that you can take it into the patient's home and give it without any special apparatus except a Luer syringe. We believe it has a definite place and have seen no bad results from its use.

DR. COLLIN FOULDRUD, PHILADELPHIA, PA.—I am rather amazed that a 50 per cent glucose solution is used. We are told by the neurologist to use the 50 per cent solution for dehydration in many diseases of the brain. It has always seemed that the 50 per cent solution should be reserved for the edematous patients.

We use either a 15 to 25 per cent solution with equally good results and very few reactions when the container and rubber tubes are cleansed first with sterile water.

DR. JOSEPH BRETTAUER, NEW YORK CITY.—I do not intend to discuss glucose, having employed it only in extreme instances. I want, however, to express my surprise that a series of 200 cases of shock are reported as having occurred in a clinic during a comparatively short period of time. Of course shock always has and always will occur in women whose general condition is considerably below par, who must undergo an abdominal operation requiring a longer time than average, and who bleed copiously during operation. In my experience, covering over forty years, such instances have been infrequent. It is my opinion that the average case requires no antishock treatment, either pre- or postoperative.

DR. POLAK (closing).—It has been the routine practice in our clinic for a number of years to use intravenous glucose in every case of infection, in the interval between transfusions. These are given about every four days and on the other days our septic patients receive approximately 75 gm. of glucose a day. We feel that it stimulates the heart muscle and pancreatic action and insulin is not needed, the "spill" in the urine takes care of the excess or overflow.

The preoperative value of glucose was noted in the Obstetric Service. The woman who has been in labor for a long time, sometimes twenty, thirty or forty hours, is a bad operative risk if operation becomes necessary but if she is given preoperative glucose in concentrated solution we find a very definite improvement and the patient who would have been otherwise an extremely grave operative risk under anesthesia shows little disturbance of pulse or pulse pressure.

I think that Professor Dodds missed my point. All of our patients eat sugar before operation, just as we insist that each woman shall take eight to ten glasses of water.

The reason that we use a 50 per cent solution of glucose is, first of all, because of its availability. It was difficult to carry out the detail of the gum-glucose solution of Dr. Farrar as to purity of preparation, temperature, speed, etc., but we found that we could throw 50 per cent hypertonic solution of glucose into the vein with a Luer syringe at a much more rapid rate without reaction, and we have not had reaction in these cases.

As to Dr. Brettauer's remarks, the 200 cases of shock which he criticized represent the work of some of my associates in other hospitals as well as our own hospital, furthermore but few were in the severe class.

As to the question regarding obliterating the vein, it depends very much on the care in injecting the glucose. If one gets into the vein with but little injury to the intima there is no thrombosis. We have carried patients who have received 50 gm. twice a day for a week and have had no obliteration of the vein.

2. Reconstruction of the Urethra and Vesical Sphincter by Employing the Levator Ani Muscles, by Dr. Marion Douglass, Cleveland, Ohio. (By invitation.) (See page 739.)

DISCUSSION

DR. REGINALD M. RAWLS, NEW YORK, N. Y.—In 1880 Emmet reported that he had succeeded in six or seven cases in restoring the urethra but also said he felt disposed not to waste his energy on the slim chance of success or permanent benefit from this procedure. In ten years, 1906-1916, at the Woman's Hospital we have had four cases of total destruction of the urethra admitted for repair, and I have operated upon three of these patients. In one I used the technic as suggested by Taussig and transplanted the levator ani muscle. But because of the extent of the injury to the levators, it was impossible to transplant the muscle at a point above the reconstructed urethra. After ten plastic operations I succeeded in restoring the urethra and closing the fistula in the base of the bladder. At the final operation for a small urethral fistula the levators were found transplanted but had retracted, and it was found necessary to resuture them to a higher plane. In my second patient, who disappeared after one operation, I was able to restore about two-thirds of the urethra. In this case I used the method of dissecting flaps from the vagina and suturing them over a catheter without attempting to transplant the levators.

My third case was one which had been caused by the unskillful delivery of a monster and resulted in sepsis, complete laceration of the pelvic floor, complete destruction of the urethra and a vesicovaginal fistula. In this patient by one operation I was able to restore the urethra, relieve the vesicovaginal fistula and restore continence. The technic used was that presented to this Society in 1923 by Ward with the suggestion offered by Farrar at the same meeting. In looking through the index of our Transactions for fifty years I find this the only presentation under the title of reconstruction of the urethra. This method is to dissect free a flap from the vagina and pull it through a submucous tunnel as devised by Kelly, further in suturing this flap into a tube before pulling it through the tunnel as suggested by Farrar, and finally in utilizing the labium minus as a graft to close in the raw area, as suggested by Noble. In addition to the above I also made a more complete tube by suturing it at its base to the lower stab wound just above the fistula. This operation was done in 1924 and is the first time that Farrar's suggestion was adopted. The levator was not transplanted, and we used a Kelly stitch to relieve the incontinence. This patient was followed for over four years. She had perfect control immediately after operation and fair control except under unusual exertion or emotional stress, although about one year following the operation she was delivered of a small premature baby which survived.

It is interesting to note, as Dr. Douglass has shown, that it was not until 1878 that Lawson Tait first used vaginal flaps dissected partially from the underlying tissues to reconstruct the urethra. Also as early as 1863 Baker Brown operated upon a patient, closing the opening into the vagina and then tunnelled under the symphysis to give an outlet for the urine. At the present time it seems that the method of choice is the one of the submucous tunnel lined with a graft from the vagina, as in one of Dr. Douglass' cases, and used also in my third case.

DR. FREDERICK J. TAUSSIG, ST. LOUIS, MO.—I am very glad to see this little operation of mine resurrected. The patient reported in 1918 subsequently became pregnant again and, in spite of the delivery of a normal sized child, the reconstructed urethra held and functioned as well as it did before. That is my only experience with this particular operation. I have never had 100 per cent

satisfactory results with any method. If I succeed in getting the patient comfortable, so that she does not wet the bed at night and is only partially incontinent in the daytime, I am fairly well satisfied.

It seems to me that the important thing is prevention of the condition. There are primarily two groups of patients in whom we have to reconstruct the urethra: first those in whom there are severe lacerations at childbirth; and second, those in whom there is a resection of the urethra for carcinoma. Now, after my unsatisfactory experience in trying to reconstruct a new urethra that will function after removal of the urethra for carcinoma, and since my final results from irradiation have proved so eminently satisfactory, better even than after surgical excision, I prefer in carcinoma of the urethra to use radium locally in combination with radical removal of the tributary lymph glands.

It is very difficult to compare results as to lacerations because each case is different. For instance, a case that has been bothering me for six or seven years is one in which the symphysis was ruptured as well as the urethra. I think in cases of that kind we are dealing with problems that are almost beyond the possibility of complete surgical repair. In this case, with the assistance of an orthopedic surgeon, I transplanted a part of the rectus muscle and fascia, at the same time having the orthopedic surgeon do a plastic on the ruptured symphysis. That operation was only partially successful. Whenever possible, I think the use of the levator muscle is distinctly advantageous and if the lacerations have not gone too deeply and the muscle has not atrophied, its use as described will be a great help in our final result. Personally, the various methods of plastic repair of the canal have not been satisfactory. It has just meant a lengthening of the urethral tube. The results are more satisfactory where we get good muscular support.

One thing I would like to stress. In plastic work about the urethra I always at the same time provide suprapubic drainage. Wound healing is infinitely better.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—All who have spoken are experts in plastic surgery, yet they admit that the plastic results are not altogether satisfactory and that a number of these patients leak under strain and excitement. Many cases come to us who have been previously operated upon a number of times and the tissues are so scarred that they are very difficult to handle and mobilization of the bladder or urethra is impossible, hence I do not want this discussion to close without calling your attention to the fact that some of these intractable cases can be relieved of their difficulty by transplantation of the ureters into the colon by the Coffey technic.

DR. CAREY CULBERTSON, CHICAGO, ILL.—In 1928 I saw my first case of destruction of the urethra. This patient had urinary incontinence for four years following an induced abortion. Not only was the posterior urethra gone but a rosette of vesical mucosa protruded into the vagina. There was no lateral infiltration or extensive scar tissue. The patient had not been operated upon previously and the case appeared to be a simple one. I operated upon her in March, 1928, by the Dudley operation. This did not hold. In May of the same year I decided to take Dr. Taussig's advice, making wide vaginal flaps so that levator musculature could be brought together without tension. This constructed a bridge under the vesical neck that held, and there was no longer any eversion of vesical mucosa. She had some continence after this operation. It was about that time that the operation described by Dr. Douglass was published and I persuaded the patient to permit a third operation. A spade-shaped flap was transposed anteriorly and this held very satisfactorily. I saw the patient last November and she was free from urinary incontinence and had then a urethra about 5 cm. long.

DR. DOUGLASS (closing).—I believe as Dr. Rawls has said, that there is very little question but that the levators separate and pull apart, especially above the urethra, but I believe that their crossing with contraction gives the urethra sufficient support from below to furnish quite good functional results.

I agree with Dr. Taussig that in these cases suprapubic drainage is of great importance, and certainly I believe that I would have obtained better results in so far as the urethra is concerned if I had employed suprapubic drainage and had not left a catheter in the newly constructed canal for such a long time.

3. Basal Metabolic Rates in Late Pregnancy and the Puerperium, by Dr. Otto H. Schwarz, St. Louis, Mo. (See October issue, page 571.)

DISCUSSION

DR. EDWARD L. KING, NEW ORLEANS, LA.—I agree with Dr. Schwarz that the contention of Wheeler in regard to the increased metabolism being entirely due to the maternal increase, especially in the tissues, is not well founded. An interesting observation was made in 1926 by two French writers that there should be an increase in the last month of pregnancy as high as 35 per cent. They found that this dropped to about 15 per cent about the eighth day postpartum. I would like to call attention to their note that intrauterine fetal death caused a drop in the metabolic rate. More recently, in the March number, 1931, of the *Journal of the Canadian Medical Association*, Abbott and Ball have reviewed this subject incidentally in connection with other points in thyroid metabolism. They raised the question whether there should be an increase in basal metabolism during pregnancy and state that if there is no increase in the fifth month the possibility of cretinism in the child should be considered. In the South we do not have nearly so high an incidence of goiter as in the northern sections, especially in the region of the Great Lakes.

DR. CARL H. DAVIS, MILWAUKEE.—The problem of thyroid deficiency is a very serious one to those living around the Great Lakes. We are finding in our gynecologic patients, as well as the obstetric patients, that a much greater number of women have hypothyroid conditions than has heretofore been believed.

The interest of the profession over a period of years has been directed almost entirely to the so-called toxic states of the thyroid gland to the extent that we have completely overlooked the fact that while a few patients have toxic conditions, very many more have hypothyroid states. Furthermore, many of these patients get into the hands of surgeons when they are going over from a subnormal thyroid into a very definite hypothyroid state. Many of these women will for a few months have evidences of a toxic condition. Some of these patients are most difficult to handle with the hypothyroidism which follows a thyroid operation because of the fact that they are not then able to take desiccated thyroid. If adequately treated medically, the patients without evidence of adenoma who develop evidence of hyperthyroid conditions, frequently will pass from a very high basal metabolic rate to a minus twenty or thirty within six months and thereafter will definitely require desiccated thyroid.

4. Prevention and Repair of Hernia in Low Median-Line Incisions, by Dr. James C. Masson, Rochester, Minn. (See October issue, page 596.)

DISCUSSION

DR. JOHN A. McGLINN, PHILADELPHIA.—In reviewing our hospital work for the past year we found two abdominal incisional hernias, one a right rectus follow-

ing an acute appendix and one a patient on whom I was operating for a large tumor. In reviewing our 2,000 abdominal operations only 5 were for incisional hernia. I believe the factors of lack of drainage and lack of infection play a great part in the elimination of hernia. Another important fact which I think contributes to hernia is that so many operators are apt to turn over the very important function of closing the abdominal incision to the resident physician. This is a very important part of the operation. In my hospital service I either close the incision personally or my first assistant does so but never the resident. A very important factor, of course, in the prevention of hernia is the close and proper approximation of all the tissues.

I cannot subscribe to what Dr. Masson has said about spinal anesthesia as predisposing either to hernia or to pulmonary complications. Of course, it is true that you get pulmonary complications with spinal anesthesia just the same as you sometimes do with inhalation anesthesia, but spinal anesthesia does do several things, to my mind, in the prevention of hernia. First, it gives a better relaxation and therefore necessitates less traction upon the wound; and secondly, the patient rests very much better after operation and there is no straining from vomiting which causes a great increase of intraabdominal pressure. Therefore this form of anesthesia should tend toward the prevention of hernia.

My experience with procain in the few cases in which I have used it has not been very satisfactory for prolonged operations. There is this to be remembered, however, about novocain, that the German preparation is heavier than the cerebro-spinal fluid and therefore the patient should be kept in the sitting position for ten minutes before being thrown back, whereas with procain the patient must be thrown back immediately.

DR. HARVEY B. MATTHEWS, BROOKLYN, N. Y.—I think that the prevention of incisional hernias is largely a matter of good technic, save perhaps in those very asthenic patients whose healing powers are poor. Even then technic has a great deal to do with perfect healing. So many operators extend the incision beyond the fat and skin and the very end of the incision is difficult to get to unless you are meticulously careful. I make the skin incision longer than the fascia and the fascia longer than the peritoneal incision, so that the peritoneal ends, as well as fascia and fat can be well approximated.

DR. ROBERT L. DICKINSON, NEW YORK CITY.—It is well worth taking up an older procedure, the transverse or Pfannenstiel incision. This is applicable, for instance to laparotomies for the sterilization of the feeble-minded and insane, of which several thousand have been done here in America. In all cases where there is little work to be done inside the abdomen and a small incision will suffice, the transverse incision should be carefully considered. It has certain advantages. Stay sutures are hardly necessary. Hernias are rare because you do not make the longitudinal incision in the fascia and it works on the general principle of gridironing or putting the various layers of the incision at right angles.

It has another advantage, the cosmetic effect. It is hidden in the fold above the mons. The small transverse incision is correct surgery because it follows a natural line of skin. The ordinary incision is one of which the surgeon should be ashamed when it leaves a permanent *telegraph pole scar* showing where the stay sutures went in. If those sutures make exit on the edge of the skin, and are tied around a test tube you avoid this deformity. Avoidance of excess tension on sutures and small abdominal incisions should be considered as important preventions of hernia.

DR. GEORGE GRAY WARD, New York City.—In my clinic at the Woman's Hospital for a great many years the median line incision has been used. Then dissecting the skin and fat off the left rectus sheath, the sheath of the rectus is opened over the center of the belly of the muscle, the edges of the fascia are picked up and the muscle is displaced to one side and the peritoneum is opened up underneath the rectus muscle. Thus when we close the wound we have an intramuscular incision, as the rectus muscle is interposed so that there is no direct wound from the abdominal cavity to the skin. We have had considerable experience with this method over a period of years and in a study made a few years ago we were able to trace only two hernias, both very small, in one of which the wound had been closed by an assistant; the other was in the lower angle and extremely small. It seems to me that this is a very satisfactory method. We always use stay sutures and do not have the telegraph pole deformity because we tie those stay sutures over a roll of gauze.

DR. MASSON (closing).—Dr. McGlinn has mentioned that hernias are not as common as formerly. I agree with him. Many of the cases which I have reported followed operations performed many years ago. I still think, however, that hernias are more common than is generally realized.

Most of the 313 patients referred to in my paper came from various parts of the country; as a rule the previous operation had been done in city hospitals. It is possible that surgeons in the smaller hospitals close most of the wounds themselves and probably with more care than is frequently observed in large, crowded hospitals. As far as the surgeon is concerned spinal anesthesia is an ideal one for any operation, but I want to stress the point that statistics in a large number of cases show that the same types of operations done under properly selected general anesthetics by surgeons who are doing much work will be done with a lower mortality. Spinal anesthesia with the use of nupercaine has the advantage of giving surgical anesthesia for from two to three hours and probably is of advantage when a long operation is contemplated or a relatively slow operator is performing the operation, but I consider it more dangerous than any general anesthetic, local infiltration, regional block or spinal anesthesia, with the use of procaine. I think Dr. McGlinn must have misunderstood me, as I did not mean to infer that spinal anesthesia predisposes in any way to pulmonary complications but they occasionally occur following its use.

Four of the cases of hernia followed the Pfannenstiel type of incision. I have used this type of incision very little. One practically never sees postoperative hernia in a median rectus incision unless there has been infection, but it may occur in the low median-line incision, without preceding infection, particularly in women with a wide diastasis of the recti muscles.

I would like to stress the difference between living sutures and mass transplantation of fascia lata. The latter seldom heals satisfactorily on all sides whereas the living sutures can be counted on to live and remain where placed in most cases. I now advise operation with the use of living sutures in cases in which I did not attempt to operate ten years ago. I had the opportunity of examining the inside of a hernia that I had repaired about six months previously. The second operation was for malignant lesions of the large bowel. I could feel the living sutures which had been placed both vertically and transversely, like the gut of a tennis racket.

I regard the Cameron or Battle type of incision satisfactory for appendectomy, but I have never used it when operating on pelvic lesions. I always feel that I get better exposure with a median-line incision and feel absolutely sure that with proper closure there need not be any fear of hernia.

5. **Regeneration of the Uterine Mucosa After Delivery, With Especial Reference to the Placental Site**, by Dr. J. Whitridge Williams, Baltimore, Md. (See page 664.)

DISCUSSION

DR. WILLIAM B. HENDRY, TORONTO, ONT.—When I heard that I was to discuss this paper of Dr. Williams I did a very unorthodox thing. I had curettings taken from the uteri of 24 women who had been normally confined. These curettings were taken under strictly aseptic precautions, and we took four specimens from each of these uteri, one from the anterior wall, one from the posterior, and the other two laterally. It did not seem to do the patients any harm but we got certain interesting results.

Twenty-four patients were curetted during the puerperium; ten between the fourth and fifth days and fourteen between the ninth and eleventh days. All were multiparae with two exceptions. All had normal spontaneous births with a normal third stage and normal involution of the uterus. Patients with a fever of 99° F. or over were not curetted.

The method was as follows: Patients were draped with sterile towels, vulva cleansed with lysol solution, bivalve speculum inserted and cervix exposed. Lochia discharge wiped away and cervix and vagina cleansed with 1 per cent lysol solution.

When curettings were obtained on the fifth day a large sharp-edged curette was used. On the tenth day a small curette was necessary due to the closing of the internal os. The actual curettage of the uterus caused the patient practically no distress. Pain was experienced on insertion of the speculum and on passage of the curette through the cervix. It varied in intensity according to the dilatation of the cervix and type of patients.

The gross appearance of the curettings was practically the same on the fifth and tenth day. The amount of tissue obtained was always very scant, varying only slightly with different patients. In two patients no tissue was obtained. It was impossible to be sure that the placental site was curetted although in all probability it was. Four strokes were made with the curette, one on the anterior, one on the posterior wall of the uterus and one on each lateral wall.

On microscopic examination of the tissue so obtained between the fourth and fifth day, only one section revealed chorionic villi. The rest showed typical decidual tissue in various stages of degeneration. The cells were swollen, cell boundaries indistinct and the nuclei stained faintly. Many of the nuclei were rather granular while others were homogeneous and pale in appearance. The cytoplasm of the cells which were most degenerated had a pinkish hue. The spongy layer of the decidua showed stromal degeneration while epithelium of the glands presented a frayed irregular appearance and in many areas was absent.

Hemorrhage into the stroma was slight, appeared to be quite recent and probably due to operative trauma. The most constant finding was extensive infiltration of polymorphonuclear leucocytes throughout the stroma. In many cases, particularly when degeneration was most marked, the infiltration was so extensive as to practically obscure the stromal cells. *There was no evident dilatation of capillary vessels and none were thrombosed.*

Curettings obtained on the ninth and tenth days presented an altogether different picture. Endometrium of the nongravid stage was evident and of a hyperplasia pattern. Glands varied in size, were lined by a low cuboidal epithelium with deeply stained nuclei and scant cytoplasm. Stromal cells were small and also deeply stained. Nuclear figures were present both in the stromal and epithelial elements, but were quite infrequent.

Stroma was still infiltrated with polymorphonuclears but to a much less marked degree than on the fifth day.

Decidual cells were still evident but they presented a hyalinized appearance and were only represented in faint outline. Groups of such cells were frequently seen almost completely surrounded by regenerated endometrial stroma. The regenerating epithelium in some areas presented an almost malignant appearance, cells varying in size and staining qualities, with large deeply stained nuclei.

In the first few days postpartum there is a heavy polymorphonuclear infiltration of all remaining decidua. For some reason degeneration is rapid and both stromal and epithelial elements are affected. By the tenth day regeneration has started probably from the base of the decidua or basal layer of the endometrium. Regeneration is rapid and both stromal and epithelium elements overgrow and surround degenerated decidual cells. At this stage evidence of the pregnancy is still present and evidence of regeneration is seen in the hyperplastic pattern of the endometrium and nuclear figures both in stroma and epithelium.

The fact that regeneration is rapid is made evident by the presence of mitoses, large atypical epithelial and stromal cells which have overgrown and surrounded remnants of decidual cells.

DR. EMIL NOVAK, BALTIMORE, Md.—Dr. Williams drew an analogy between the casting off of tissue after delivery and that which occurs with menstruation. As might be expected, the regeneration of the endometrium after pregnancy is considerably slower than that seen after menstruation. If the endometrium is examined, the very day after menstruation, its regeneration is seen to be complete. As a matter of fact, even toward the end of the actual desquamation, and while the latter is still in progress, one can observe the new epithelial surface being restored from the stumps of the uterine glands.

So rapid is this regeneration of the epithelium that one wonders whether it can be due entirely to a proliferation of the epithelium of the utricular gland stumps, especially as one rarely sees mitoses at this time. They are much more abundant in the week following menstruation. It seems not impossible that the new epithelial surface may be formed, in part at least, from a metaplasia of the stroma cells. This is not nearly as heterodoxical as it may seem, for both the epithelium and the stroma are, in the case of the uterus, of mesodermal origin.

It is of interest to speculate as to what happens to the mechanism described by Dr. Williams in cases in which there is an abnormal retention of placental tissue. Profuse uterine bleeding is not infrequently due to the retention of even very small masses of placental tissue, and even alarming bleeding may be noted at the operating table when comparatively small placental polyps are everted away. It would seem that in such cases there cannot be such an obliteration process of the blood vessels at the placental site as Dr. Williams has described. Whether this latter process is in some way inhibited by the presence of the placental tissue, or whether some extra factor like infection is responsible, is perhaps difficult to determine, and I do not know whether Dr. Williams has had an opportunity of studying cases of such type from this standpoint.

I was also interested in Dr. Hendry's description of the histologic appearance of curettings at periods after delivery, and especially in his statement that a hyperplasia pattern of the glands was at times observed. In our laboratory we have been struck by the not infrequent occurrence of hyperplasia after pregnancy, and this is associated at times with bleeding, so that often there has been a suspicion of retention of gestation products. It would seem that in these cases there is a hangover of the anterior pituitary overactivity characteristic of pregnancy. This point, however, I hope to discuss in my own paper tomorrow.

DR. KARL H. MARTZLOFF, PORTLAND, OREGON.—Dr. Williams' presentation has closed a tremendous hiatus on a subject about which we have long needed to know more. It occurred to me that regenerating endometrial epithelium, with certain exceptions, conducts itself as does the regenerating epithelium of the other hollow viscera which in turn is not so different from the mechanism governing the regeneration of the stratified epithelium of the body surface.

I may have misunderstood Dr. Williams but I thought he said that the uterine endometrium grows into the thrombosed venous sinuses in some of his cases. To me that is a most unusual observation.

DR. WILLIAMS.—You misunderstood me.

DR. MARTZLOFF.—I have seen it grow under a fibrinocellular membrane but have never seen epithelium grow into a blood clot such as I understood Dr. Williams to describe.

DR. JAMES R. GOODALL, MONTREAL, CANADA.—This presentation opens up a new and interesting chapter in uterine physiology. It brings up a question for which I hope Dr. Williams may have a ready solution. It is as follows: the degeneration in the endometrium is similar in every respect to the hyaline degeneration that affects the subplacental vessels postpartum, from the area immediately below the placental attachment right out to the main uterine trunks. We know that this hyaline change is an elastoid degeneration preparatory to absorption. In the uterine musculature this destruction and absorption is more or less complete after some months, but at times traces remain in a fixed state as evidence of the previous parturient history of the woman. Why then is it that the vessels within the uterine wall remain for absorption, whereas that portion of the same vessels within the endometrium is slowly exfoliated as demonstrated today?

DR. WILLIAMS (closing).—Of course, I could not say all I desired in the short time at my disposal, but some of the points brought up in the discussion will be found mentioned in the published paper.

I was very much interested in what Dr. Hendry found in his fresh curettings and especially that he found mitotic figures in many cases. Personally I was not able to find them in my specimens until the end of the second week, but instead I found very extraordinary degenerative changes in the epithelial cells, so that I am inclined to believe that in the first two weeks after labor the bulk of the growth is by direct instead of indirect or mitotic division. I consider Dr. Hendry's contribution to the discussion very valuable.

Dr. Novak asked what happens when portions of villi are retained. I can only speak from the findings in a couple of specimens because I have not had much material along such lines. Some months ago at the request of the psychiatrists I did an abortion on a woman who had homicidal mania. About twelve weeks later it was thought for various reasons that she should be sterilized and accordingly I removed the uterus. It contained a few villi but the placental site twelve weeks after labor had not yet disappeared, and in general corresponded to those in my series at the fourth week. Furthermore, the retention of these villi seemed to give rise to interesting changes, as giant cells were still present beneath the placental site, instead of having disappeared within a week or ten days as usual. So I would say that after abortion certain changes occur which we cannot talk of at the present time because we do not know enough about them, but what happens after abortion with the retention of the fetal elements is a totally different process from the normal regeneration after labor.

Dr. Martzloff was under a misapprehension, because I did not mean to say that endometrial tissue grew from the vessels, but that it grows down between

them. In general, I would say that throughout the entire process there is a great excess of epithelial production and I imagine it is comparable to other processes in Nature, where she is lavish in her repair and overdoes it in many cases.

Dr. Goodall wrote an important monograph in 1910 on the involution of the uterus, and was particularly interested in the arterial changes. I cannot answer his question except to say that we find these changes in vessels throughout the entire uterine wall. Many of them remain for years so that we can diagnose the existence of pregnancy from their presence. We can trace many of these vessels right up to and into the placental site, so I take it that the degenerated vessels which we see in that location represent the terminal ends of vessels further out in the uterine wall. These terminal ends are cast off, but the proximal ends remain. I cannot tell you why that is, but the fundamental reason is rather sound I think and if all this material were left in the placental site, the result would be that each pregnancy would lead to the formation of a huge amount of scar tissue in the endometrium which would completely interfere with its cyclical changes and thus bring to a premature end the reproductive process. The way in which this is brought about I am not prepared to say.

In the paper itself a number of points are dwelt upon which I could not bring out in the few minutes at my disposal, but I wanted to bring before you the idea that the placental site is gotten rid of by a process of exfoliation and that during the puerperium considerable masses of tissue are being thrown off into the uterine cavity, so that the process of exfoliation does not end with the disappearance of the lochia but persists for weeks afterward.

6. **The Length of Labor**, by Drs. J. C. Litzenberg, L. A. Calkins, and E. D. Plass. (Paper read by Dr. Calkins, Kansas City, Kansas.) (See October issue, page 604.)

DISCUSSION

DR. JAMES R. MCCORD, ATLANTA, GA.—I have always believed that the length of labor was due to the character of the uterine contractions, the temperament of the patient, the flexion of the head, etc. I have said that labor is longer in the negro, and the perineal floor does not tear as quickly as in the white. This is shown in the statistics from our clinic: In our last 7,192 deliveries we have done 182 forceps and 18 cesarean sections; have had 848 first degree lacerations, 564 second, and 9 third. The average birth weight of the colored baby, not syphilitic, has been found to be six pounds and twelve and one-half ounces.

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MD.—I was very much interested in this paper, and the figures set before you are very important. My own figures I cannot give, but in a study of my service, labor in colored women was found actually longer than in white women in Baltimore. That is quite contrary to the general belief. Our material shows that their labor is definitely longer. At first glance, it appeared that the prolongation might be due to contracted pelvis, which appears more frequently in the colored than in the white women. We eliminated all such cases, and still found that in normal pelvis labor in colored women is longer than in the white. Every comparison that Dr. Peckham has made has been against the black race, as he showed that every complication is worse in the colored, except placenta previa. They have twice as many infections and three times as many deaths even when treated in the same clinic and by the same staff.

Dr. McCord's figures interested me because they come from further south. He says the colored woman has a little smaller baby than the white woman. Our

colored babies are, I think, a little larger than his, but still definitely smaller than the white ones.

DR. ARTHUR H. BILL, CLEVELAND, OHIO.—The length of the second stage in occipitoposterior position is of particular interest. Dr. Calkins showed in the case of women who delivered spontaneously that the second stage of labor was only a few minutes longer when there was a posterior position than when there was an anterior position. I, therefore, conclude that when the head rotated, the second stage was then comparatively little longer than it was in the cases where there was an anterior position originally. I would also judge that the inference was true that in those cases in which the head did not rotate very promptly to an anterior position there was not a spontaneous birth because his series did not include those that were operated upon. Now that would lead me to think that I was justified in claiming that a physician should be able to tell very early in the second stage whether there would be spontaneous rotation, and if not whether there would be an excessively prolonged second stage with the likelihood of there not being a spontaneous birth, as indicated by Dr. Calkins' paper.

DR. HUGO EHRENFEST, St. Louis, Mo.—I would like to ask two questions. The first in regard to the old primigravida. A few years ago a Danish or Swedish writer concluded that there was a great difference in regard to labor between the "old primigravida" who was old when she married but became pregnant promptly, and the "old primigravida" who was married many years and grew old before she became pregnant. The women of the first group might have as easy a labor as any primigravida. The woman of the second group is the one with the greater chance of a difficult labor if impregnation was delayed by a cervical, usually inflammatory process, leading to the rigid cervix.

Whenever I deal with an old primigravida, and especially if she has been married a long time, I try to obtain by careful palpation some idea as regards the rigidity of the cervix. I think that these findings have a prognostic value.

As to the second question. Dr. Calkins concludes that the main factor in the duration of labor is the activity of the uterus. A recent paper of a German investigator emphasizes the value of counting uterine contractions. I fully realize the difficulty of such an undertaking, but does Dr. Calkins agree that this all-important factor of uterine activity would statistically best be expressed in the number of uterine contractions required to accomplish expulsion of the child?

DR. CALKINS (closing).—Dr. McCord very properly brought up the point that our figures should not be considered in any way as suggesting a "time limit" for the duration of labor. In our opinion, it will never be possible to set a "time limit" for either the first or second stage of labor. In this paper we were considering averages only and in so doing meant to imply that there was no such thing as a "time limit." The point should have been made more definite.

Dr. Bill inferred that we had discussed only those occiput-posteriors which had rotated anteriorly and then had been delivered spontaneously. A relatively small number rotated posteriorly and delivered spontaneously. A large number rotated anteriorly either late in the first stage or early in the second. The majority did not rotate anteriorly until the head had reached the pelvic floor.

Dr. Ehrenfest brought up several very interesting points. We do not know whether the length of married life before pregnancy occurs has anything to do with the length of the subsequent labor. Dr. Ehrenfest very properly brought out the fact that the consistency of the cervix is an important factor in determining the length of the first stage. We cannot quite agree with him that the number of uterine contractions is as important as the intensity of the individual contraction.

(To be continued in December.)

NEW YORK OBSTETRICAL SOCIETY

MEETING OF FEBRUARY 10, 1931

DR. FRANK R. SMITH (by invitation) read a paper entitled **The Significance of Incomplete Fusion of the Müllerian Ducts in Pregnancy and Parturition, With a Report on 35 Cases.** (For original article, see page 714.)

DISCUSSION

DR. HERMANN GRAD.—I have encountered two cases of double uterus and in each the patient has had four children from the right uterus. In the last case that I had I operated upon the patient for acute appendicitis. I knew before the operation that she had a double uterus from the vaginal examination, but on going into her obstetric history I found she was not at all aware of her condition. She had a double uterus, a double vagina, two cervices, with a very well-developed ovary on the right side, while that on the left side was sclerotic. The other case was one in which there was a suspicion of cancer of the cervix, but this was proved not to be so. I operated for a fibroid of the uterus and there, too, she was not aware of the condition.

I have had one experience with double uterus during labor. In that case the abdomen was never opened, but there the patient had a double vagina and a double cervix, and the cervix on the nonpregnant side caused considerable obstruction in delivering the baby.

DR. ELIOT BISHOP.—In a case of inevitable miscarriage at about five months, the fetus and placenta were expressed, but the patient bled profusely and was rapidly packed. In a day or so the packing was removed. She had a normal convalescence, except that she continued to discharge a black, tarry material for some time. A double uterus was found.

The practical reason for this report that I would like to bring out is: she must have had some *decidual* contents in the *other* part of her uterus which was the cause of the continued discharge.

DR. REGINALD M. RAWLS.—I had one case of uterus didelphys in which the vaginal septum was removed at the age of sixteen. While under my observation she was pregnant twice, each time in the right uterus. The cervix of the right side was almost in the midline, whereas the cervix on the left side was in a culdesac. In each pregnancy the right uterus enlarged regularly and the left uterus only slightly. The first time she went to four months. The second pregnancy was full term and she was delivered normally. The left uterus did not give any trouble at all.

DR. SMITH (closing).—In regard to a question as to whether there were other associated deformities, there were none noted in any of these cases. Dr. William P. Graves has pointed out that one reason why we see so few cases of complete lack of fusion, that is, the uterus didelphys, is that the condition in the living individual is so frequently associated with other deformities of the pelvis which are incompatible with life. As a matter of fact, I was looking for other deformities associated with this, but was unable to find them in any single case.

DR. GEORGE W. CORNER (by invitation) presented a paper entitled **The Function of the Corpus Luteum.** This consisted of a review of recent work in the field of corpus luteum physiology, including the work of Hisaw, Corner, E. Allen, W. M. Allen, Hartman, and others. The further work now in progress will be published at a later date.

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MARCH 10, 1931

DR. F. C. HOLDEN reported a case of **Adenomyoma of the Uterus**, which occurred in a young girl.

B. S., age fourteen years, single, high school student. Bowels regular. Weight 121 pounds eight months ago; loss of 13 pounds since onset of present illness. Menstruation began one year ago, interval twenty-eight days, duration four to five days, amount of flow moderate, no pain at all for first six periods. At end of the January, 1930, period, she had excruciating pain in left lower quadrant for one week postmenstrual (had 3 hypodermies in one day). February period was normal. She had similar and equally severe attacks of postmenstrual pain in left lower quadrant, lasting seven to ten days after her March, April, June, and September periods. With the period of October 14, 1930, for the first time, the severe pain came at the onset and persisted with no relief. When the patient was seen October 23, 1930, she had been in bed for two weeks and had had innumerable hypodermies of pantopon for pain. There was no fever at any time. X-ray and urine examinations were negative and blood count normal.



Fig. 1.—Fibroid nodule, bisected, showing central cavity containing old blood.

Examination.—General appearance, well-developed young girl of fourteen years, apparently in considerable pain, walking with a limp to keep her weight off of the left leg. Abdominal tenderness on pressure over left lower quadrant. Hymen intact, normal vaginal introitus. Rectovaginal: Small cervix pointing forward and to the right, uterus retroflexed, definitely enlarged, hard, regular in contour, lying over to the left, not adherent, exquisitely tender. No adnexal masses made out.

Preoperative Diagnosis.—Retroversion of uterus with possible dermoid of left ovary.

Operation.—On November 5, 1930, the patient was operated upon under gas-oxygen-ether. Through a left rectus incision, the fundus was found retroverted and to the left. Both tubes and ovaries were found to be normal. The fundus was brought into view and on first impression it seemed to be a bicornuate uterus. On more thorough investigation, a fibroid nodule was found in the left half of an otherwise normal uterus, was dissected out, and the uterine wall was then closed in two layers. The uterine cavity was not entered. Following a one point suspen-

sion of the uterus, the abdomen was closed. The patient had a smooth convalescence and was discharged two weeks later.

The nodule (Fig. 1) was firm, symmetrically round, $2\frac{1}{2}$ inches in diameter. The gross appearance was that of a fibroid. Upon section (Fig. 2), there was found directly in the center, a circular cavity, 1 inch in diameter, filled with a small amount of old black blood. The lining of this cavity was very smooth, being identical in gross appearance with that of uterine endometrium (Fig. 3). There was no connection between the central cavity and the uterine cavity.



Fig. 2.—Low power, section through central cavity showing its lining to be well-developed normal uterine endometrium.



Fig. 3.—High power, same as Fig. 2.

Comment.—The case is unusual due to the age of the patient—the occurrence of such a fibroid at the age of fourteen years, only six months after the onset of menstruation. The possibilities as to its origin are equally interesting. It was not a direct extension from the uterine mucosa as we saw at the time of operation. Metastases of uterine mucosa from the uterus with development of a fibroid about it is equally improbable, as it would not have reached that size and develop-

ment in such a short period of time. The third possibility that it was of developmental origin, is the most likely, namely, that it was an aborted development of a double uterus, the second uterus remaining as a miniature uterine cavity without any outlet, surrounded by its musculature, the whole remaining as a fibroid nodule in the normal uterine wall. With each period, the menstrual flow of this enclosed uterine cavity accumulated, causing increasing dysmenorrhea. Since the operation, four and one-half months ago, the patient has had normal painless menstrual periods.

DR. RANSOM S. HOOKER (by invitation) presented a preliminary report of the Joint Committee for the Study of Maternal Mortality in New York City, in which he described the plan of the investigation and the tentative results of the Committee's work for the first of the three years which the study will require. At the end of this period a full report will be published in the JOURNAL.

DISCUSSION AND COMMENT

DR. GEORGE W. KOSMAK.—The New York Obstetrical Society is to be congratulated on the very successful outcome of the work which they really initiated by formal resolution a little over a year ago and upon the fact that the services of a man have been secured who has been able to give his full time to this investigation. Dr. Hooker found it necessary to revise to a large extent the methods which had been employed heretofore in developing a similar series of statistics, and I believe that this is going to be the most noteworthy study of its kind which has been made in this country, because these puerperal deaths are investigated in a week or ten days after they occur when the facts in relation to them are still fresh in the minds of the attendants.

It has been very satisfactory to note the cooperation which the Committee has obtained throughout the city of New York.

As I sat here I heard a number of remarks from those about me with regard to the startling character of the figures. As a member of the Committee which has gone over these figures month by month I can echo that expression—they are very startling, and the question is: Where shall the responsibility be placed for these startling figures?

The propaganda which has been put out in past years by the Children's Bureau and other organizations with reference to the position that the United States occupies in the list of civilized countries in its puerperal mortality statistics, is something that we can disregard to a certain extent because these statistics have not been based on similar grounds. Notwithstanding the probably exaggerated character of the figures that have been brought forward for special reasons, I think we must admit that the death rate from puerperal causes in this country is much too high, and that this as well as other studies will show as time goes on that very many of these deaths are preventable.

Now, please do not accept these figures as final; this is just a tentative statement of the first year's work, but the members of the Committee felt that the results that have been obtained thus far should be placed before you. Moreover we have been very much gratified to note the support which other cities have given this movement, and will undertake similar studies. So I feel that at the end of another five-year period we will get some real knowledge as to the actual causes for puerperal deaths in this country, and then we will be able to formulate our recommendations for improvement on a substantial basis.

DR. H. C. WILLIAMSON presented a paper entitled **A Simple Technic for Cesarean Section Under Local Infiltration Anesthesia**. (For original article, see page 761.)

DISCUSSION

DR. A. C. BECK.—We have done quite a number of operations under local anesthesia. I do not think it is necessary to anesthetize the visceral peritoneum. If we do a classical section we do not anesthetize the uterus at all and are able to suture the uterus without any difficulty whatsoever. It is not necessary to give gas under those circumstances. In doing a low section, however, it does hurt the patient without a general anesthetic, while removing the baby.

There was one point in the technic that seemed rather unusual, namely, giving of pituitrin before the birth of the child. Formerly, when we did the classical operation, we always gave pituitrin before the uterus was incised, but we discontinued that when we took up the low technic as we found that it seemed to increase the difficulty in the extraction of the child.

DR. WILLIAMSON (closing).—The case illustrated in my film bled more than is usual when a patient is operated upon by this technic. I do not know just why there is less bleeding under local anesthesia. I had occasion to operate upon one patient with central placenta previa, who was practically exsanguinated on her arrival at Bellevue Hospital. She was given saline by hypodermoclysis, gum glucose solution intravenously and a transfusion. The operation was uneventful and with only a small blood loss. It is for this type of patient that local anesthesia is most useful.

In regard to the visceral peritoneum which we infiltrate; I do not think it very sensitive, but the large wheal that is raised makes dissection of the flap very easy.

I gave the pituitrin extract a little too early in one patient and had difficulty extracting the baby. Ordinarily, however, this does not occur.

DR. S. A. COSGROVE read a paper entitled **Nupercaine Subdurally in Obstetrics**. (For original article, see page 763.)

DISCUSSION

DR. GEORGE W. KOSMAK.—In the records of the Committee for the Study of Maternal Mortality, a considerable number of deaths were noted in patients who had had a spinal anesthetic. I would like to ask Dr. Cosgrove if he has any information as to that subject, or whether he assumes these deaths were due to the anesthesia, or that the anesthetic was a contributing factor.

DR. COSGROVE (closing).—As I have just said, we have had a series of nearly 1,800 cases on our service without any deaths, and I am permitted to quote the experience of my colleague, Dr. Miner, who has used it in nearly 2,000 cases for general surgery with no deaths. My own impression is that where death was attributed to spinal anesthesia it was either due to gross errors in technic, or attributed to the anesthetic unjustly. In a recent paper by Dr. Koster, of Brooklyn, in the *American Journal of Surgery*, he goes into quite an extensive analysis of the reported causes of death from spinal anesthesia and most of them can be discounted as having been unjustly attributed to the anesthetic agent.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

The Interrelationship of the Anterior Hypophysis and the Ovaries

2. Further Advances (June, 1929—June, 1931)

By C. F. FLUHMAN, M.D., SAN FRANCISCO, CALIF.

(From the Department of Obstetrics and Gynecology, Stanford University School of Medicine)

IN A PREVIOUS contribution (Fluhmann⁵⁰), a review of the literature concerning the most outstanding recent advances in our knowledge of the physiology and pathology of the anterior hypophysis in its relation to the female genital organs, was given. Although only two years have elapsed the subject has engaged the attention of such an army of investigators and has resulted in the publication of such a large number of reports, as to warrant a second review covering the main achievements of this short period.

As progress is made in unravelling the mysteries of the so-called "sex hormones," one is astounded at the complexity of problems which have arisen in this connection, and in order to simplify this review it has seemed particularly desirable to indicate the trend of modern research on this subject rather than to attempt the presentation of a detailed list of all the contributions that have been made. For these reasons a number of references have been omitted, and the subject is considered under various subheadings, namely, (1) terminology, (2) the ovary-stimulating factors of the anterior hypophysis, (3) ovary-stimulating substances from extrahypophyseal sources, (4) the stimulation or inhibition of the anterior hypophysis by ovarian hormones, (5) the Aschheim-Zondek pregnancy test, (6) anterior pituitary hormone tests in nonpregnant conditions, and (7) the use of ovary-stimulating substances for therapeutic purposes.

Although such work lies beyond the scope of this cursory review, attention must be directed to important contributions which have recently been made regarding the anterior hypophysis-thyroid interrelationship (Smith, Loeb, Wiesner, Crew, and others), as well as the notable advances in our knowledge of the second ovarian, or corpus luteum, hormone (Corner, W. Allen, Claiberg, Kraus, and others). These studies are inevitably closely allied with the subjects of this review.

1. TERMINOLOGY

It is certainly to be hoped that students in the field of the anterior hypophyseal sex factors will be spared the confusion that has arisen in regard to the terminology of the ovarian follicular hormone, which

is now known under an appalling multiplicity of names. For the purposes of this review, a modification of the terms suggested by Zondek has been adopted since they are very simple and lend themselves readily to abbreviation. The two ovary-stimulating anterior hypophyseal factors are referred to as (1) the "*Anterior-Pituitary-Hormone-A*" (abbreviation APH-A), the follicle-ripening factor, also at times named the "maturity-provoking hormone," and (2) the "*Anterior-Pituitary-Hormone-B*" (abbreviation APH-B), the luteinization hormone. The reactions to the Aschheim-Zondek test are given as Anterior Pituitary Reactions I, II, and III, that is APR I refers to the induction of follicle ripening, APR II to the production of hemorrhagic cysts, and APR III to the formation of luteinized cysts or abnormal corpora lutea with imprisoned ova, in the ovaries of the immature test mouse or rat. The terms *Prolan*, *Prehormone*, and *Emmenin* refer to definite preparations of ovary-stimulating substances, and lead to confusion when they are employed as synonymous with "anterior pituitary hormone." The two ovarian hormones are listed as (1) *estrin*, otherwise known as "the female sex hormone," the estrous-producing hormone, ovarian follicular hormone, theelin, menformon, folliculin, and numerous others, and (2) *progestin*, the name given by Corner to a specific product of the corpus luteum, and which is called *lutin* by Zondek and a number of German investigators.

2. THE OVARY-STIMULATING FACTORS OF THE ANTERIOR HYPOPHYSIS

Since it has been definitely established that the anterior lobe manufactures a substance capable of stimulating follicle growth, it is of importance to determine if there is actually a second hormone which can induce lutein-cell formation. Although this point has not been conclusively demonstrated, it is generally accepted as a fact, and additional confirmation has been brought forward. Wiesner and Crew¹⁶⁰ maintain that the anterior lobe has two very definite "gonadotropic" influences, an estrogenic and a kyogenic. The former effect is obtained when tissue implants or acid extracts are employed and is manifested by the development of graafian follicles in the ovaries and cornification in the vaginal mucosa of the immature mouse, while the kyogenic effect is found when alkaline extracts are employed and is demonstrated by luteinization in the ovaries and mucification in the vaginal mucosa. Wiesner and Crew have also shown experimentally that these results are not due to different concentrations of the extracts, and consequently assume that the anterior lobe manufactures two different substances. Claus^{19, 20} has found that an acid extract of desiccated anterior pituitary lobe may be subdivided into two parts, one of which is not soluble in absolute alcohol and yields APR I in immature mice, whereas the second fraction (soluble in absolute alcohol) gives rise to luteinization (APR III). Evans and Simpson⁴⁷ have pointed to the importance of the intraperitoneal administration of extracts to rats in order to detect traces of the luteinization hormone, and believe this finding supports the assumption that there are two anterior lobe sex hormones. Fevold, Hisaw, and Leonard⁵⁸ have recently reported a method by which they have succeeded in extracting and separating two gonad-stimulating hormones from anterior lobe tissue. They have found that one of these stimulates follicular growth, and the second causes luteinization. It is of especial interest that the luteinizing hormone they have isolated does not act on the

immature ovary unless the ovary has previously been stimulated to follicular activity by the first extract.

The question as to whether the changes set up in the ovaries of immature mice by the anterior lobe can really be considered as a true "maturity-provoking" effect has again been brought up by Mahnert.¹⁰⁰ He has been unable to induce pregnancy in such animals and therefore maintains that ova capable of fertilization are not produced. Fels⁵⁰ has shown that following Prolan administration to immature mice the ovaries are only necessary for thirty hours in order to obtain a cornification of the vaginal mucosa. Loeser¹⁰⁶ induced ovulation in pregnant rabbits by injections of a powdered anterior pituitary extract, and Wolfe¹⁰¹ by a saline suspension of fresh anterior lobe tissue. Engle⁴³ has demonstrated the importance of anterior lobe implants in the successful grafting of ovaries from immature female rats into normal adult and castrated male rats. He feels that the actions of the sex hormones are not antagonistic, but act selectively on tissues which normally respond to their stimulus. Hartman⁷² was able to induce menstruation in a monkey by means of pituitary implants from pigs, and also observed a growth of numerous graafian follicles. Emanuel⁴² has corroborated the finding of Engle, and Evans and Simpson that implants of anterior hypophyseal tissue from spayed rats are more potent in inducing ovarian changes than those from normal animals. From two sources have come methods of extracting a luteinizing hormone from the anterior lobe which is separate from the growth hormone (Bugbee, et al.¹²; Reiss, et al.¹³⁶). Goss and Cole⁷⁰ have analyzed some of the chemical properties of the ovary-stimulating principle found in the blood serum of mares. Burns¹⁴ has studied the effects of hypophyseal hormones upon amblystoma larvae.

In an analysis of disorders of sex in 367 cases of hypophyseal adenomas, Henderson⁸³ found that the sexual dysfunction occurs only when the sella turcica has become considerably expanded, so that he believes it is due solely to the compression of the basophile cells by the space-occupying lesion. Novak and Koff¹²² have described the occurrence of the characteristic pregnancy changes in the anterior hypophysis in patients with chorionepithelioma. Neumann¹²¹ believes that ovarian changes in the way of follicle ripening in newborn girls are due to the gonad-stimulating hormones found in the circulation during pregnancy. Borak and Windholz⁹ found fully developed castration changes in the hypophysis of a thirty-year-old woman who had had an extensive pelvic irradiation with resultant atrophy of the ovarian follicular apparatus. Hofbauer⁸⁹ found that the administration of anterior pituitary alkaline extracts or implants to guinea pigs results in the formation of numerous follicles in the ovaries and a hyperplasia of the uterine epithelium. He believes that this is evidence for the etiology of hyperplasia of the endometrium in the human, but objection to this conception has been raised by Frankl,⁶⁶ and Fluhmann.⁶³ Hofbauer^{87, 88} has also found abnormal epithelial formations in the cervix uteri of guinea pigs following the administration of anterior lobe substances and believes that these have an important bearing on the etiology of epidermidalization, leucoplakia, and carcinoma. However, Hartmann and Olbers⁷⁵ have pointed out that these abnormal epithelial changes may occur at certain stages of the normal estrual cycle in guinea pigs, and if so their relation to pathologic conditions is not so clear.

In one of the most important contributions that have appeared during the period under consideration, Smith¹⁴⁵ has given the technic of his operation for removing the hypophysis of the rat, and has analyzed its consequences as well as the reparative effects of replacement therapy. Smith and MacDowell¹⁴⁷ have described an hereditary anterior pituitary deficiency in the mouse, and "by daily transplants of fresh rat pituitaries, the small size, sterility, and associated endocrine abnormalities of an hereditary dwarfism carried by a strain of silver mice have been corrected, with the outstanding exception of the deficiency in the anterior lobe of the pituitary." Smith and Dortzbach¹⁴⁶ studied the sex hormone content of the pig fetus and found demonstrable quantities in fetus of 17 to 18 cm. crown-rump length. The interest of this observation lies in the fact that this just precedes the stage at which Baseom and Osterud⁵ found that a rapid growth of the testis begins.

In their original study, Smith and Engle had shown the effects of the protracted administration of anterior lobe implants in mature rats and mice. Confirmation of their findings has been advanced by Siegmund¹⁴⁴ who found that if APH is given in small amounts to mature mice there is a resultant lengthening of the period of estrus, but in large amounts the animals become sterile and the ovaries show a "small cystic degeneration." Nelson¹²⁰ was able to induce estrual changes in 8 adult female rats which had remained in a state of anestrus for a period of some weeks. Marrian and Parkes¹¹² have shown that the use of a vitamin-B deficiency diet in rats causes a permanent anestrus, but that the administration of APH during the experimental anestrus results in ovulation and in the immediate appearance of estrual changes in the accessory organs. This work was confirmed by Evans and Simpson,⁴⁸ who also found that the hypophyses of rats given a diet deficient in the antineuritic vitamin B have a diminished potency to stimulate follicle ripening. The anestrus of such animals is thus apparently due to a deficiency of the anterior hypophysis resulting from the dietary condition.

Ovulation in the rabbit normally occurs within twelve hours after copulation, but Fee and Parkes⁵³ have shown that ovulation does not take place if a hypophysectomy is performed within one hour after copulation. On the other hand, if the operation is delayed for over an hour ovulation occurs, thus suggesting that the hypophysis is essential for ovulation, but only for a short period of time. This conception was further strengthened by Hill and Parkes^{84, 85} who induced ovulation in rabbits (hypophysectomized soon after copulation), by administering ovary-stimulating placental extracts. Deanesby, Fee and Parkes²⁹ have studied the corpora lutea resulting in rabbits hypophysectomized over one hour after copulation, and could find no essential difference from the normal in the development of this structure. They warn, however, against assuming from this observation that the anterior lobe is not essential for corpus luteum formation.

In an attempt to determine which cells of the anterior lobe are concerned with the production of the various hormones, Philipp¹²⁰ has conducted extensive implantation experiments with human material at different age periods. He believes that the eosinophiles are probably concerned with the production of APH-A, but that it is questionable whether the basophiles are involved in the luteinization effect. Haterius and Charipper^{76, 77} have made histologic studies of the an-

terior pituitary lobe of mice, both male and female, following the continuous administration of anterior pituitary substance, and note the presence of characteristic "pregnancy cells." The same authors¹⁸ believe they have demonstrated a histologic rhythmicity of the anterior lobe during the estrous cycle, the diestrous phase being characterized by a predominance of eosinophilic cells and late estrus by the presence of basophiles with only an occasional poorly staining eosinophile.

3. OVARY-STIMULATING SUBSTANCES FROM EXTRAHYPOPHYSEAL SOURCES

In one of the early studies on the test for APH, Aschheim and Zondek reported the presence of a similar substance or substances in the placenta, blood, urine, decidua, and amniotic fluid from pregnant women, while recently the same finding has been reported for colostrum and milk (Heim⁵¹), and also (during pregnancy) for saliva (Trancu-Rainer¹⁵³) and the serum in blisters resulting from the application of cantharides (Heim⁵²). These observations are of great physiologic interest and have raised many questions regarding the exact relationship between the ovary-stimulating substances present in these tissues and those of the anterior hypophysis.

The discovery that the human placenta has ovary-stimulating properties has been corroborated by numerous observers (Klein,⁹⁷ Philipp,¹²⁶ Siegert and Schmidt-Neumann,¹⁴³ Mirskaia,¹¹⁶ Centanni¹⁷), and Wiesner³⁵ has obtained two extracts, one corresponding essentially to APH-A and the other to APH-B. Collip,^{22, 23, 24, 25, 26} in addition to estrin, has obtained two distinct preparations from the placenta, one of which he names Emmenin, while the second is referred to as the "anterior-pituitary-like" extract. Emmenin is estrogenic, probably through stimulation of the intact ovary, and it is active when administered orally. It does not interfere with the estrous cycles of normal adult rats. The "anterior-pituitary-like" extract is also estrogenic, but in addition it stimulates the development of corpora lutea which are normal in appearance. It is not effective when given by mouth, and while it does not interfere with cycles in normal adults, continuous administration results in the appearance of normal cycles in immature rats.

A group of workers (Philipp^{125, 126, 127, 128, 130}; Collip^{22, 23, 24, 25, 26}; Fels,⁵⁷ Motta,¹¹⁹ and others) have advanced the theory that the placenta manufactures ovary-stimulating substances and does not merely store a product of the anterior hypophysis. The main proponents of this conception are Philipp, and Collip, and the problem has assumed major importance since it is directly concerned with the large amounts of APH found in the blood and urine during pregnancy. The chief arguments in favor of the "placental origin theory" are: (1) The placenta contains very large amounts of an ovary-stimulating substance (or substances); (2) the characteristic histologic pregnancy changes in the anterior pituitary gland of women do not appear until the fifth month of gestation although large amounts of APH are found very early in the blood and urine; (3) the Aschheim-Zondek test is positive in cases of hydatidiform mole and chorionepithelioma, and becomes negative following the removal of the tumor growth; (4) implants of the anterior lobe from human donors, whether male or female, old or young, are always positive for APH, but *negative results are obtained with implants from pregnant women* (Philipp^{126, 127}; cor-

roborated by Ehrhardt and Mayes,⁴¹ Zondek,¹⁷¹ and others); (5) a number of observations by Collip²⁴ as a result of his researches with Emmenin, namely, (a) this extract is effective when given orally, whereas anterior lobe substance apparently is not, (b) extracts prepared from anterior lobes by the use of acetone, as in the case of Emmenin, have been found to be non-estrogenic in character, and (c) the prolonged treatment of normal adult rats with large doses of Emmenin has not resulted in any noticeable effect upon the cycles or upon impregnation or lactation.

It must be acknowledged that although some of the arguments advanced are impressive, they cannot possibly be accepted as conclusive, and Zondek¹⁷¹ has recently stated many of the chief objections:

(1) Hypophysectomy in pregnant animals always results in abortion; (2) the diminished amounts of ovary-stimulating substances in the anterior lobe of pregnant women does not mean a lowered production on the part of this gland, but an increase in its utilization by the body so that none remains stored up in the hypophysis. Zondek points to an appropriate simile with Graves' disease where there is an hormonal overproduction on the part of the thyroid but the gland itself contains less thyroxin and less iodine than in normal conditions; (3) in patients with genital carcinoma Zondek finds large amounts of APH-A excreted in the urine, and here as in pregnancy the anterior hypophysis contains *less* APH than normally; (4) in pregnant cows and pigs there is no APH demonstrable in the blood or urine, and since there is apparently not the same call for large amounts of this substance as there is in the human being, the anterior lobe of these animals shows a normal content of APH in the hypophysis. (This finding in the cow had been reported by Evans and Simpson,⁴⁵ while Bacon⁴ found a lessened hormone content); (5) the presence of these substances in the placenta is not evidence that they are manufactured in that organ. (In one patient Zondek found larger quantities of APH-A and B in the walls and contents of an ovarian cyst than in the placenta of the same patient, and it does not seem possible that they were formed in the cyst); (6) the large amount of APH in the urine appears so early in pregnancy that it is questionable whether the placenta has sufficiently developed at that stage to produce such quantities.

It would seem that the final proof must come from further studies with hypophysectomy in pregnant animals, and it would be essential to obtain evidence such as there is for the placental production of estrin. In this case it has been possible to demonstrate that a bilateral oophorectomy may be performed in the human being without any disturbance in the course of gestation or the continued production of the hormone (Waldstein,¹⁵⁷ Szarka¹⁵²).

In the meantime a considerable amount of attention has been directed toward determining the biologic characteristics of the sex hormones found in the urine of pregnant women. Friedman^{67, 68} and later Wolfe¹⁰¹ showed that the intravenous injection of pregnancy urine rapidly stimulates ovulation in the adult female rabbit, and this observation has been used to develop a new diagnostic procedure. Jares⁹⁰ has noted that this finding in the rabbit does not apply to the guinea pig, and Kelly⁹⁵ was able to induce abortion in guinea pigs by the administration of pregnancy urine. On the other hand, Katzman, Levin and Doisy^{94, 104} by means of a luteinizing extract made from

this source were able to produce an inhibition of estrus in normal adult rats, and during pregnancy a prolongation of the gestation period. Dingemanse and de Jongh³² have advanced additional evidence that there are two ovary-stimulating hormones present in the urine, and Büngeler and Ehrhardt¹³ in a series of experiments based on Warburg's studies found that the injection of pregnancy urine into immature mice results in a change in the metabolism of the uterus which quickly leads to growth of that organ. Borst and Gostimirović¹⁰ found that prolonged treatment with urine from cancer patients, which contains mainly APH-A, results in marked follicle atresia. In a noteworthy contribution, Dickens³¹ has given a method of preparation and described various chemical properties of the gonad-stimulating hormone from the urine of pregnancy.

Of great importance are the attempts which have been made to discover the exact relationship between the ovary-stimulating principles of the anterior hypophysis and those found in the urine during pregnancy. Engle⁴⁴ has compared the effects in the immature mouse of injections of urine from pregnant women and of daily transplantations of anterior lobe, and stated "it is difficult to consider the two types of response as being due to the same factor from the anterior lobe." Wallen-Lawrence and van Dyke¹⁵⁸ believe that the weight of evidence indicates that the gonad-stimulating substance of pregnancy urine is extrahypophyseal in origin. Reiss, Selye and Balint¹³⁷ have found a difference in the results obtained from the injection of a luteinizing extract of the anterior hypophysis¹³⁶ and those from the injection of the hormones of pregnancy urine. The extract produces corpora lutea, but no marked hypertrophy of the uterus and ovaries such as results from the administration of the urine. Papanicolaou¹²⁴ has studied certain vascular phenomena resulting from the injection of urine from pregnant cows into immature guinea pigs, and on the basis of his finding, he questions the existence of any specific hormone primarily affecting the sex glands and causing a luteinization of ovarian follicles. And finally, an important contribution has recently been made by Reichert, et al.,¹³⁴ who reported on the ineffectiveness of prolan to induce ovarian changes in hypophysectomized dogs and rats. (This finding is in startling contrast to the efficacy of anterior hypophyseal implants in the hypophysectomized rats of Smith, and the dogs of Reichert.) However, Evans, et al.,⁴⁹ also find that gonadal stimulation in hypophysectomized animals may be obtained with prolan when it is given along with an extract of the hypophyseal growth hormone. For this reason, they advance the theory that prolan should be considered as an "activator" which either converts an inactive prohormone in the hypophysis to an active form or else is able actually to convert the growth-stimulating into the gonad-stimulating hormone.

4. THE STIMULATION OR INHIBITION OF THE ANTERIOR HYPOPHYSIS BY OVARIAN HORMONES

This aspect of the problem is as yet obscure but should be considered as of vital importance, as its solution may offer a ready explanation for a number of features directly concerned with the estrual or menstrual cycles. The work of the past two years has been directed chiefly along three lines of inquiry. (1) Changes observed following the administration of ovarian preparations. (2) Effects of simultane-

ous injections of anterior hypophyseal and ovarian substances, and (3) studies in hypophysectomized animals.

On the basis of observations made following the injection of estrin into male rats, Moore and Price¹¹⁸ believe that estrin suppresses the hypophysis, making unavailable the secretion necessary for gonadal function. V. Bisceglie⁷ has reported that the prolonged administration of follicular fluid can produce histologic changes in the anterior lobe of the guinea pig, as manifested by a hyperemia, an increase in acidophilic cells and colloid material, and a disappearance of basophilic cells. Kunde, et al.,^{99, 100} stated that estrin injections in a dog resulted in a lessening in the size of the anterior lobe of the hypophysis with a diminution in the amount of cytoplasm in the chromophobe cells. Kraul¹⁰¹ has observed the effects of implants of the hypophysis from animals previously given endocrine substances from the ovary or placenta, and noted that these implants were more potent to produce abnormal luteinization than those from untreated animals. Meyer, Leonard, et al.,^{115, 103} found that the administration of estrin to rats decreases the gonad-stimulating power of the hypophysis, while Spencer, et al.,¹⁴⁸ have observed a small but significant lessening of the growth rate of young rats given estrin, thus suggesting a diminution in the production of the growth hormone. Wade and Doisy¹⁵⁵ also found that 27 of 36 immature rats given theelin or theelol gained less in body weight than their controls. On the other hand, Fluhmann and Kulchar⁶⁴ have found that a prolonged administration of estrin to spayed rats does not prevent the formation of numerous "castration cells," and more recently a similar result has been reported by Zondek and Berblinger.¹⁷²

It had been suggested previously by Siegmund and Mahnert that estrin can inhibit the ovary-stimulating properties of the anterior lobe when they are injected simultaneously, and further evidence has been advanced by Dahlberg and Akesson,²⁸ and Dahlberg.²⁷ Zondek¹⁷⁰ could not corroborate these observations, but other evidence in favor of this conception has been advanced by Kallas.⁹² This observer found that if he united in parabiosis a castrate with a normal animal the latter showed the stimulating effects of the anterior hypophysis due to the excessive production or nonutilization of the sex hormone by the spayed partner. If, however, the castrate is given estrin these effects are not produced in the normal partner, thus pointing to an inhibitory effect on the anterior lobe. On the other hand, Mahnert¹¹⁰ and Hauptstein^{79, 80} believe that it is a corpus luteum hormone rather than estrin which offers antagonism to the anterior hypophyseal sex hormone.

Hartman, Firor and Geiling^{73, 74} have reported a series of experiments which, if confirmed, will alter many of our present conceptions regarding the menstrual cycle. They have found that estrin does not produce uterine bleeding in hypophysectomized monkeys as it does in the castrate, and conclude that this hormone acts through the hypophysis and not directly upon the genital tract as it is now generally accepted. In addition, they have observed that uterine bleeding can be produced by the administration of anterior lobe hormone in both castrated and hypophysectomized monkeys.

5. THE ASCHHEIM-ZONDEK PREGNANCY TEST

The Aschheim-Zondek procedure for the diagnosis of pregnancy has apparently received world-wide approbation. Aschheim² has pub-

lished a valuable monograph dealing with the technic and results of the test, while many articles report satisfactory results from numerous clinics (Wahl,¹⁵⁶ Kaplan,⁹³ Joffick,⁹¹ Vogt,¹⁵⁴ Pistuddi,¹³¹ Evans and Simpson,⁴⁶ Kiselev,³⁶ Aschheim,³ Hannan,⁷¹ v. Probstner,¹³³ Liese and Auer,¹⁰⁵ Stone,¹⁵⁰ and others). An analysis of the various hormone tests for pregnancy that have been advanced in recent years has been conducted by Mazer and Hoffman,¹¹⁴ but their results with the Aschheim-Zondek method have not been as promising as those of other workers. Stern¹⁴⁰ has sounded a warning regarding possible social abuses with resultant legal complications following the injudicious use of the test, and this has called forth an editorial comment in the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*.³⁵

Cole and Hart²¹ have shown the presence of large amounts of APH in the blood of mares in early pregnancy, and this has been corroborated by Zondek¹⁶⁹ who also found that the urine of these animals shows APH-A but no APH-B. Ehrhardt^{36, 37, 38} found that a positive Aschheim-Zondek reaction can be obtained from the urine of patients following a blood transfusion from a pregnant donor. The excretion of the hormone is so rapid that in one case this occurred ten minutes following the transfusion. Although Ehrhardt and Zondek maintain that a positive reaction may be obtained from the urine of pregnant monkeys, Allen, et al.,¹ failed to demonstrate any ovary-stimulating substance as a result of 12 tests in one animal.

The Aschheim-Zondek test has been recommended as a valuable procedure for the diagnosis of hydatidiform mole and chorionepithelioma by Rössler,¹³⁸ and his findings have been corroborated by numerous observers (Fels,⁵⁵ Otto,¹²³ Schultze-Rhonhof,¹⁴¹ Mack and Catherwood,¹⁰⁷ Ehrhardt^{39, 40} Fanz and Gault,⁵² Fahlbusch,⁵¹ and Haupt.⁷⁸ In these cases the reaction is much more intense than during pregnancy, and remains positive in the presence of metastases from a chorionepithelioma or when small fragments remain after a curettage for hydatidiform mole. It may thus be used to advantage in successfully controlling the treatment of such patients.

A number of important modifications in the technic of the test have been reported. Zondek^{166, 167} has described a method consisting of a concentration of the urine by precipitating with alcohol and detoxicating with ether, and Eberson,³³ and Eberson and Silverberg³⁴ reported 100 per cent correct results and a speeding-up of the time required for the test by the use of a similar procedure. Böhne⁸ has made cultures from the urine of pregnant women, and stated that the detoxication by ether which Zondek advocates is due to the fact that ether kills harmful bacteria present in the specimens. Brouha, Hinglais, and Simmonet¹¹ used male mice as test animals and noted the weight of the seminal vesicles and the testicles as criteria, but Kraus¹⁰² questioned the efficacy of this procedure as a pregnancy test. Considerable interest was aroused by reports of a cutaneous reaction with Prolan as a means of diagnosis for early pregnancy, but recent studies are not encouraging (Porges and Pollaczek,¹³² Deutsch,³⁰ Strauss¹⁵¹). Zondek¹⁶⁸ has directed attention to an interesting procedure which is used for the determination of the presence of ovary-stimulating substances in tissues and discussed its importance in the differential diagnosis of chorionepithelioma.

Zondek¹⁶³ has described the effects of Prolan injections in rabbits, while Friedman^{67, 68} demonstrated the rapidity by which ovulation

may be induced in this animal by the intravenous administration of small amounts of urine from pregnant women, and this procedure now bids fair to supplant the Aschheim-Zondek test for general laboratory usage. It is simple of execution, a result may be obtained in thirty hours, no microscopic sections are essential, and preliminary reports seem to vouch for its accuracy (Schneider,^{139, 140} Friedman and Lapham,⁶⁹ Reinhart and Scott,¹³⁵ Magath and Randall¹⁰⁸).

6. ANTERIOR PITUITARY HORMONE TESTS IN NONPREGNANT CONDITIONS

Although the Aschheim-Zondek test has been used principally for the early diagnosis of pregnancy, it may find its application in the study of various endocrine conditions. Fluhmann^{60, 61} has used the test to study the presence of APH in the blood and has found that it is consistently negative in women with normal menstruation, and in patients with "hypo-ovarian" conditions, as manifested by short periods of amenorrhea, scanty irregular menses, or persistently delayed menses. On the other hand, positive tests were obtained in three groups, (a) during pregnancy, when the test is characterized by APR II and III, (b) in the presence of a total ovarian deficiency (following complete operative extirpation of the ovaries, after radiation castration, in the postclimacteric, and in a number of women with prolonged periods of amenorrhea), when the test gave mainly APR I but also occasionally APR III, and (c) in a smaller group composed of women with irregular profuse periods at the time of the menopause, and in younger patients with too profuse and too frequent menses, when APR I was found. On the strength of these findings in nonpregnant individuals, Fluhmann⁶² suggests a clinical grouping based on ovarian function as determined by the history of the menstrual cycle. In the first two groups (1. normal ovarian function; 2. hypohormonal conditions) the test has proved consistently negative, while in the other two categories (3. afunctional conditions; 4. hyperhormonal conditions) a high percentage of positive tests are found. Zondek¹⁷⁰ has also obtained positive results (APR I) with the blood of a few women with marked ovarian deficiency, and further confirmation has been advanced by Mazer and Hoffman.¹¹⁴ In a recent preliminary communication Frank, Goldberger and Spielman⁶⁵ described a method of concentrating larger amounts of blood by which they have been able to obtain an APR I during the normal menstrual cycle. They have found the strongest reactions from the sixth to the ninth days of the cycle, and believe that approximately 25 mouse units per liter is the maximum amount of "Prolan A" in the circulation of the normal nonpregnant woman.

Zondek^{164, 165} has reported that APR I is also obtained from the urine of women at the time of the climacteric, following castration, and in patients with genital carcinoma, while Neumann¹²¹ has found the same result with the urine of children up to the age of ten.

7. THE USE OF OVARY-STIMULATING SUBSTANCES FOR THERAPEUTIC PURPOSES

Of special importance to the practitioner is the possibility, arising from this work, of obtaining an ovary-stimulating substance which may be employed for the treatment of amenorrhea, delayed menses, scanty menstruation, and sterility. This work must be considered as still in the experimental stage but it is of interest that investigation

along this line is proceeding hand in hand with the physiologic studies. The extracts at present in use therapeutically are either made from the urine of pregnant women, as for example, Prolan, or from the placenta, as Emmenin.

Encouraging results in the treatment of so-called "hypo-ovarian" conditions from the use of the German preparations Prolan, Prehormone and Homhormone, have been reported by Zondek,¹⁷⁰ Seitz,¹⁴² Hirsh-Hoffman and Wulk,⁸⁶ and Koehler.⁹⁸ Zamkoff¹⁶² has also had very encouraging experiences from the use of urine from pregnant women, and good results from the injection of whole blood or blood serum from human pregnant donors have been reported by de Maortua¹¹¹ and Esch.⁵⁰ Zondek¹⁷⁰ has employed Prolan for the treatment of pelvic inflammatory disease in view of his previous observation that the administration of this extract causes a local increase of temperature, and believes that in association with bed-rest this method of therapy is highly commendable. This contention is supported by Montag,¹¹⁷ but on the other hand an adverse report has been given by Bauer and Lehfeldt,⁶ who in addition failed to obtain successful results in 10 cases of menstrual disturbances attributed to ovarian dysfunction. Fellner⁵⁴ believes that Feminin is preferable to anterior pituitary hormone from a therapeutic standpoint in view of the danger of injury to the ovaries. Martin¹¹³ has successfully used Prolan in high doses for patients with intractable menorrhagia, and suggests this as a possible means of producing a hormonal castration.

The treatment of 135 cases of deranged ovarian function by the oral administration of the placental extract Emmenin has been reported by Campbell and Collip.^{15, 16} These authors note unsatisfactory results in the treatment of primary amenorrhea, but find a high percentage of patients with improvement in cases of secondary amenorrhea, oligomenorrhea, dysmenorrhea, polymenorrhea, and menopausal symptoms. They have also obtained an arrest of the bleeding in certain forms of menorrhagia and metrorrhagia by the hypodermic administration of Collip's "anterior-pituitary-like" placental extract.

REFERENCES

- (1) Allen, E., Maddux, W. P., and Kennedy, J. W.: *Proc. Soc. Exper. Biol. & Med.* 28: 403, 1931. (2) Aschheim, S.: *Die Schwangerschaftsdiagnose aus dem Harn*, S. Karger, Berlin, 1930. (3) *Idem*: *AM. J. OBST. & GYNEC.* 19: 335, 1930. (4) Bacon, A. R.: *AM. J. OBST. & GYNEC.* 19: 352, 1930. (5) Bascom, K. F., and Osterud, H. L.: *Anat. Rec.* 37: 63, 1927. (6) Bauer, A. W., and Lehfeldt, H.: *Zentralbl. f. Gynäk.* 53: 3404, 1929. (7) v. Bisceglie: *Endocrinol. e patol. costit.* 5: 70, 1930. (8) Böhme, C.: *Klin. Wehnschr.* 10: 210, 1931. (9) Borak, J., and Windholz, F.: *Klin. Wehnschr.* 10: 586, 1931. (10) Borst, M., and D. Gostimirović, D.: *München. med. Wehnschr.* 78: 19, 1931. (11) Brouha, L., Hinglais, H., Simonet, H.: *Paris méd.* 1: 221, 1930. (12) Bugbee, E. P., Simond, A. E., and Grimes, H. M.: *Endocrinology* 15: 41, 1931. (13) Büngeler, W., and Ehrhardt, K.: *Klin. Wehnschr.* 10: 593, 1931. (14) Burns, R. K.: *Proc. Soc. Exper. Biol. & Med.* 27: 836, 1930. (15) Campbell, A. D., and Collip, J. B.: *Canad. M. A. J.* 22: 219, 1930. (16) *Idem*: *Canad. M. A. J.* 23: 633, 1930. (17) Centanni, G.: *Riv. ital. di ginecol.* 11: 203, 1930. (18) Charipper, H. A., and Haterius, H. O.: *Anat. Rec.* 45: 210, 1930. (19) Claus, P. E.: *Proc. Soc. Exper. Biol. & Med.* 27: 29, 1929. (20) *Idem*: *Physiol. Zööl.* 4: 36, 1931. (21) Cole, H. H., and Hart, G. H.: *Am. J. Physiol.* 93: 57, 1930. (22) Collip, J. B.: *Canad. M. A. J.* 22: 215, 1930. (23) *Idem*: *Nature*, Mar. 22, 1930. (24) *Idem*: *Canad. M. A. J.* 22: 761, 1930. (25) *Idem*: *Brit. Med. J.* 2: 1080, 1930. (26) *Idem*: *Proc. Calif. Academy of Med.*, p. 38, 1930. (27) Dahlberg, G.: *Klin. Wehnschr.* 9: 1298, 1930. (28) Dahlberg, G., and Akesson, S.: *Acta obst. et gynec. Scandinav.* 10: 63, 1930. (29) Deanesby, R., Fee, A. R., and Parkes, A. S.: *J. Physiol.* 70: 38, 1930. (30) Deutsch, A.: *Zentralbl. f. Gynäk.* 53:

- 2920, 1929. (31) *Dickens, F.*: Biochem. J. 24: 1507, 1930. (32) *Dingemanse, E., and de Jongh, S. E.*: Arch. f. d. ges. Physiol. 226: 543, 1931. (33) *Ebersson, F.*: Proc. Soc. Exper. Biol. & Med. 28: 407, 1931. (34) *Ebersson, F., and Silverberg, M. H.*: J. A. M. A., 96: 2176, 1931. (35) *Editorial*: AM. J. OBST. & GYNEC. 20: 278, 1930. (36) *Ehrhardt, K.*: Deutsche med. Wehnschr. 56: 431, 1930. (37) *Idem*: Deutsche med. Wehnschr. 56: 1560, 1930. (38) *Idem*: Zentralbl. f. Gynäk. 54: 2947, 1930. (39) *Idem*: Zentralbl. f. Gynäk. 54: 1538, 1930. (40) *Idem*: Deutsche med. Wehnschr. 56: 917, 1930. (41) *Ehrhardt, K., and Mayes, B. T.*: Zentralbl. f. Gynäk. 54: 2949, 1930. (42) *Emanuel, S.*: Compt. rend. Soc. de biol. 106: 571, 1931. (43) *Engle, E. T.*: Am. J. Anat. 44: 121, 1929. (44) *Idem*: J. A. M. A. 93: 276, 1929. (45) *Evans, H. M., and Simpson, M. E.*: Am. J. Physiol. 89: 379, 1929. (46) *Idem*: Calif. and West. Med. 32: 145, 1930. (47) *Idem*: Anat. Rec. 45: 215, 1930. (48) *Idem*: Anat. Rec. 45: 216, 1930. (49) *Evans, H. M., Meyer, K., and Simpson, M. E.*: Proc. Soc. Exper. Biol. & Med. 28: 845, 1931. (50) *Esch, P.*: Zentralbl. f. Gynäk. 54: 19, 1930. (51) *Fahlbusch, O.*: Zentralbl. f. Gynäk. 54: 1542, 1930. (52) *Fanz, J. I., and Gault, E. S.*: J. Lab. & Clin. Med. 16: 27, 1930. (53) *Fee, A. R., and Parkes, A. S.*: J. Physiol. 67: 383, 1929. (54) *Fellner, O. O.*: Klin. Wehnschr. 9: 494, 1930. (55) *Fels, E.*: Zentralbl. f. Gynäk. 53: 466, 1929. (56) *Idem*: Arch. f. Gynäk. 141: 3, 1930. (57) *Idem*: Zentralbl. f. Gynäk. 54: 2191, 1930. (58) *Fevold, H. L., Hisaw, F. L., and Leonard, S. L.*: Am. J. Physiol. 97: 291, 1931. (59) *Fluhmann, C. F.*: AM. J. OBST. & GYNEC. 18: 738, 1929. (60) *Idem*: J. A. M. A. 93: 672, 1929. (61) *Idem*: AM. J. OBST. & GYNEC. 20: 1, 1930. (62) *Idem*: Endocrinology 15: 177, 1931. (63) *Idem*: Surg. Gynec. Obst. 52: 1051, 1931. (64) *Fluhmann, C. F., and Kulchar, G. V.*: Proc. Soc. Exper. Biol. & Med. 28: 417, 1931. (65) *Frank, R. T., Goldberger, M. A., and Spielman, F.*: Proc. Soc. Exper. Biol. & Med. 28: 999, 1931. (66) *Frankl, O.*: Zentralbl. f. Gynäk. 55: 68, 1931. (67) *Friedman, M. H.*: Proc. Soc. Exper. Biol. & Med. 26: 720, 1929. (68) *Idem*: Am. J. Physiol. 90: 617, 1929. (69) *Friedman, M. H., and Lapham, M. E.*: AM. J. OBST. & GYNEC. 21: 405, 1931. (70) *Goss, H., and Cole, H. H.*: Endocrinology 15: 214, 1931. (71) *Hannan, J. H.*: Proc. Roy. Soc. Med. 23: 634, 1930. (72) *Hartman, C. G.*: Proc. Soc. Exper. Biol. & Med. 27: 338, 1930. (73) *Hartman, C. G., Firor, W. M., and Geiling, E. M. K.*: Am. J. Physiol. 95: 662, 1930. (74) *Idem*: Proc. Soc. Exper. Biol. & Med. 28: 185, 1930. (75) *Hartmann, H., and Olbers, H.*: Zentralbl. f. Gynäk. 55: 1314, 1931. (76) *Haerius, H. O., and Charipper, H. A.*: Anat. Rec. 47: 319, 1930. (77) *Idem*: Anat. Rec. 47: 319, 1930. (78) *Haupt, W.*: Zentralbl. f. Gynäk. 54: 2260, 1930. (79) *Hauptstein, P.*: Endokrinologie 7: 104, 1930. (80) *Idem*: München. med. Wehnschr. 77: 1223, 1930. (81) *Heim, K.*: Klin. Wehnschr. 10: 357, 1931. (82) *Idem*: Klin. Wehnschr. 10: 1031, 1931. (83) *Henderson, W. R.*: Endocrinology 15: 111, 1931. (84) *Hill, M., and Parkes, A. S.*: Proc. Physiol. Soc., xxiii, Mar. 15, 1930. (85) *Idem*: Proc. Roy. Soc. Lond., B 107: 30, 1930. (86) *Hirsch-Hoffman, H. U., and Wulke, H.*: Zentralbl. f. Gynäk. 54: 457, 1930. (87) *Hofbauer, J.*: Proc. Soc. Exper. Biol. & Med. 27: 1011, 1930. (88) *Idem*: Zentralbl. f. Gynäk. 54: 2393, 1930. (89) *Idem*: Zentralbl. f. Gynäk. 54: 2569, 1930. (90) *Jares, J. J.*: Anat. Rec. 49: 185, 1931. (91) *Joffick, S. D.*: China Med. J. 44: 24, 1930. (92) *Kallas, H.*: Klin. Wehnschr. 9: 1345, 1930. (93) *Kaplan, H. E.*: California & West Med. 31: 412, 1929. (94) *Katzman, P. A., Levin, L., and Doisy, E. A.*: Proc. Soc. Exper. Biol. & Med. 28: 873, 1931. (95) *Kelly, L. G.*: Anat. Rec. 48: 50, 1931. (96) *Kiselev, L.*: Ginek., 8: 307, 1929. (Bericht. f. Gynaek., 18: 144, 1930.) (97) *Klein, M.*: Compt. rend. Soc. de biol. 102: 1070, 1929. (98) *Koehler, G.*: Klin. Wehnschr. 9: 110, 1930. (99) *Kunde, M. M., D'Amour, F. E., Gustavson, R. G., and Carlson, A. J.*: Proc. Soc. Exper. Biol. & Med. 28: 122, 1930. (100) *Idem*: Am. J. Physiol. 96: 677, 1931. (101) *Kraul, L.*: AM. J. OBST. & GYNEC. 21: 301, 1931. (102) *Kraus, E. J.*: Med. Klin. 26: 1484, 1930. (103) *Leonard, S. L., Meyer, R. K., and Hisaw, F. L.*: Endocrinology 15: 17, 1931. (104) *Levin, L., Katzman, P. A., and Doisy, E. A.*: Endocrinology 15: 207, 1931. (105) *Liese, G., and Auer, E. S.*: AM. J. OBST. & GYNEC. 20: 667, 1930. (106) *Loeser, A.*: Klin. Wehnschr. 9: 1855, 1930. (107) *Mack, H. C., and Catherwood, A. E.*: AM. J. OBST. & GYNEC. 20: 670, 1930. (108) *Magath, T. B., and Randall, L. M.*: J. A. M. A. 96: 1933, 1931. (109) *Mahnert, A.*: Zentralbl. f. Gynäk. 54: 1730, 1930. (110) *Idem*: Zentralbl. f. Gynäk. 54: 2883, 1930. (111) *de Maortua, C.*: Zentralbl. f. Gynäk. 54: 736, 1930. (112) *Marrian, G. F., and Parkes, A. S.*: Proc. Roy. Soc. Lond., B 105: 248, 1929. (113) *Martin, E.*: Deutsche med. Wehnschr. 56: 580, 1930. (114) *Mazer, C., and Hoffman, J.*: J. A. M. A. 96: 19, 1931. (115) *Meyer, R. K., Leonard, S. L., Hisaw, F. L., and Martin, S. J.*: Proc. Soc. Exper. Biol. & Med. 27: 702, 1930. (116) *Mirskaina, L.*: Proc. Roy. Soc. Edin. 50: 104, 1930. (117) *Montag, H.*: Monatsschr. f. Geburtsh. u. Gynäk. 88: 212, 1931. (118) *Moore, C. R.*,

and Price, D.: Proc. Soc. Exper. Biol. & Med. 28: 38, 1930. (119) Motta, G.: Zentralbl. f. Gynäk. 54: 3096, 1930. (120) Nelson, W. O.: Endocrinology 15: 128, 1931. (121) Neumann, H. O.: Ztschr. f. Geburtsh. u. Gynäk. 99: 100, 1930. (122) Novak, E., and Koff, A. K.: AM. J. OBST. & GYNEC. 20: 481, 1930. (123) Otto, C.: Zentralbl. f. Gynäk. 53: 3037, 1929. (124) Papanicolaou, G. N.: Proc. Soc. Exper. Biol. & Med. 28: 807, 1931. (125) Philipp, E.: Zentralbl. f. Gynäk. 53: 2386, 1929. (126) Idem: Zentralbl. f. Gynäk. 54: 450, 1930. (127) Idem: Zentralbl. f. Gynäk. 54: 1858, 1930. (128) Idem: Zentralbl. f. Gynäk. 54: 2754, 1930. (129) Idem: Zentralbl. f. Gynäk. 54: 3076, 1930. (130) Idem: Zentralbl. f. Gynäk. 55: 12, 1931. (131) Pistuddi, A.: Riv. ital. de ginecol. 10: 690, 1929. (132) Porges, H., and Pollaczek, K. F.: Zentralbl. f. Gynäk. 54: 454, 1930. (133) v. Probstner, A.: Endokrinologie 7: 161, 1930. (134) Reichert, F. L., Pencharz, R. I., Simpson, M. E., Meyer, K., and Evans, H. M.: Proc. Soc. Exper. Biol. & Med. 28: 843, 1931. (135) Reinhart, H. L., and Scott, E.: J. A. M. A. 96: 1565, 1931. (136) Reiss, M., Selye, H., and Balint, J.: Endokrinologie 8: 259, 1931. (137) Idem: Endokrinologie 8: 15, 1931. (138) Rössler, H.: Ztschr. f. Geburtsh. u. Gynäk. 96: 516, 1929. (139) Schneider, P. F.: Proc. Soc. Exper. Biol. & Med. 28: 117, 1930. (140) Idem: Surg. Gynec. Obst. 52: 56, 1931. (141) Schulze-Rhonhof, F.: Zentralbl. f. Gynäk. 54: 578, 1930. (142) Seitz, L.: Monatschr. f. Geburtsh. u. Gynäk. 84: 79, 1930. (143) Siegert, F., and Schmidt-Neumann: Zentralbl. f. Gynäk. 54: 1630, 1930. (144) Siegmund, H.: Arch. f. Gynäk. 139: 521, 1930. (145) Smith, P. E.: Am. J. Anat. 45: 205, 1930. (146) Smith, P. E., and Dortsbach, C.: Anat. Rec. 43: 277, 1929. (147) Smith, P. E., and MacDowell, E. C.: Anat. Rec. 46: 249, 1930. (148) Spence, J., Gustavson, R. G., and D'Amour, F. E.: Proc. Soc. Exper. Biol. & Med. 28: 500, 1931. (149) Stern, A.: Zentralbl. f. Gynäk. 54: 1544, 1930. (150) Stone, B.: South Med. J. 23: 747, 1930. (151) Strauss, H.: Am. J. Surg. n. s. 8: 1271, 1930. (152) Szarka, S.: Zentralbl. f. Gynäk. 54: 2211, 1930. (153) Trancu-Rainer, M.: Zentralbl. f. Gynäk. 55: 1971, 1931. (154) Vogt, E.: München. med. Wehnschr. 77: 272, 1930. (155) Wade, N. J., and Doisy, E. A.: Proc. Soc. Exper. Biol. & Med. 28: 714, 1931. (156) Wahl, A.: Zentralbl. f. Gynäk. 54: 1288, 1930. (157) Waldstein: Zentralbl. f. Gynäk. 53: 1305, 1929. (158) Wallen-Lawrence, Z., and van Dyke, H. B.: Proc. Soc. Exper. Biol. & Med. 28: 956, 1931. (159) Wiesner, B. P.: Edin. Med. J. 37: 73, 1930. (160) Wiesner, B. P., and Crew, F. A. E.: Proc. Roy. Soc. Edin. 50: pt 1; 79, 1929-30. (161) Wolfe, J. M.: Anat. Rec. 49: 191, 1931. (162) Zamkoff, A. A.: Gynéc. et obst. 21: 439, 1930. (163) Zondek, B.: Zentralbl. f. Gynäk. 53: 834, 1929. (164) Idem: Klin. Wehnschr. 9: 393, 1930. (165) Idem: Klin. Wehnschr. 9: 679, 1930. (166) Idem: Klin. Wehnschr. 9: 964, 1930. (167) Idem: Klin. Wehnschr. 9: 1207, 1930. (168) Idem: Zentralbl. f. Gynäk. 54: 2306, 1930. (169) Idem: Klin. Wehnschr. 9: 2285, 1930. (170) Idem: Die Hormone des Ovariums und des Hypophysenvorderlappens, Julius Springer, Berlin, 1931. (171) Idem: Zentralbl. f. Gynäk. 55: 1, 1931. (172) Zondek, B., and Berblinger, W.: Klin. Wehnschr. 10: 1061, 1931.

STANFORD UNIVERSITY HOSPITAL.

Items

American Board of Obstetrics and Gynecology

The following names are announced by the American Board of Obstetrics and Gynecology as having been Certified:

BOURLAND, J. W.
CROSSEN, H. S.
DORLAND, W. A. N.
FALLS, F. H.
FLINT, AUSTIN
HALSTED, HARBECK
HANNA, M. A.
HARRAR, J. A.

DALLAS, TEXAS
ST. LOUIS, MO.
CHICAGO, ILL.
CHICAGO, ILL.
NEW YORK CITY
NEW YORK CITY
KANSAS CITY, MO.
NEW YORK CITY

HILDRETH, WARREN
 HINKLE, S. B.
 HOLDEN, F. C.
 HOLLADAY, E. W.
 PRIDE, W. T.
 RICE, F. W.
 TAYLOR, H. C.
 WOLFE, S. A.

NEW YORK CITY
 LITTLE ROCK, ARKANSAS
 NEW YORK CITY
 NEW YORK CITY
 MEMPHIS, TENN.
 NEW YORK CITY
 NEW YORK CITY
 BROOKLYN, N. Y.

Written Examination for Group III Applicants

The written examination for Group III applicants for Certificate from the American Board of Obstetrics and Gynecology, held on October 31, 1931, consisted of the following questions:

1. Describe the pelvic lymphatics and discuss the clinical value of a knowledge of their distribution.
2. What is the relation of the corpus luteum to menstruation?
3. Describe the pathology of carcinoma of the uterus.
4. Describe a biological test for the diagnosis of early pregnancy.
5. What factors determine normal internal rotation in vertex presentation?
6. Discuss the diagnosis of trichomonas vaginalis vaginitis and outline the treatment of such a case.
7. Describe your treatment of incomplete abortion; (a) afebrile, (b) febrile.
8. Given a woman, not in labor, seen by you for the first time, with convulsions, blood pressure 220/120, and albumin plus 4, how would you treat her?
9. What are the indications for myomectomy?
10. Describe briefly the technic of your favorite operation for the correction of retrodisplacements of the uterus, and state reasons for your preference. . .

This examination was held simultaneously in 18 different cities of the United States and Canada. The clinical examination for all applicants (Groups II and III) will be held in the Department of Obstetrics and Gynecology, University of Chicago on December 29, 1931. Approximately forty applicants had qualified for this examination at the time of receiving notice from the Secretary. For further information and application blanks please apply to the Secretary, Dr. Paul Titus, 1015 Highland Building, Pittsburgh, Pennsylvania.

Professor M. G. Serdukoff, Director of the Moscow Regional Research Institute for Maternal and Infant Welfare, is preparing a contemporary monograph with an appendix of literary references on cancer of the female genitalia. This subject is being specially studied at the oncologic section of the clinic. Professor Serdukoff therefore appeals to all authors having at any time written anything on this topic (operations, biology, pathology, medical treatment, information on organization questions, etc.) to kindly forward to him reprints of monographs, reports, or any other material.

All publications to be addressed as follows: Moscow, Piatnitzkaia, 65, App. 16. Prof. M. G. Serdukoff.

American Journal of Obstetrics and Gynecology

VOL. XXII

ST. LOUIS, DECEMBER, 1931

No. 6

Original Communications

THE VALUE OF HYPERTONIC GLUCOSE THERAPY IN PRE- AND POSTOPERATIVE CONDITIONS*

BY JOHN OSBORN POLAK, M.D., VINCENT P. MAZZOLA, M.D., AND
LEONARD ZWEIBEL, M.D., BROOKLYN, N. Y.

AN ANALYTIC review of our postoperative failures and complications will point out certain preoperative omissions, such as errors in preliminary preparation, faulty interpretation of clinical data, mistakes in the selection of anesthesia, neglect in some point of surgical technic or some error in surgical judgment, all of which have a bearing on the postoperative result. Preoperative fatigue, the character of anesthesia, the type of operation, the operative time, the amount of trauma and blood loss, all contribute to the production of shock. Therefore, the question naturally arises, how can we prevent the so-called "unavoidable surgical accidents" which sometimes become our tragedies? It has been repeatedly stressed before this Society that proper preoperative preparation lowers both the morbidity and mortality rate, to this dictum we heartily subscribe.

We all appreciate the value of preventive medicine, it is therefore, the right of every prospective patient to have meticulous study before she submits to any elective operative procedure. Pathologic conditions induce biochemical, metabolic, and hemic changes which may be of grave importance. Likewise, fatigue with its secondary effect on all of the vital organs and particularly upon the circulatory system, produces its toll. Undernourishment from a disturbed digestion or chronic disease is apt to induce a vicious cycle which results in the pathology of starvation and dehydration. Chronic anemia with the consequent changes in the hemic content has its effect on the myocardium and intestinal muscular coat; while endocrine imbalance dis-

*Read at the Fifty-sixth Annual Meeting of the American Gynecological Society, Hot Springs, May 18-20, 1931.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

turbs basal metabolism, lowers the resistance of the individual to infection and favors acidosis.

Preoperative rest, nourishing food, the free ingestion of water, small blood transfusions, cardiac tonics such as digitalis, nux vomica, or strophanthus, and metabolic stimulants, such as thyroid, all have their value in preparing the patient of the elective group.

It is a well-known fact that the ward case in any well-organized hospital, receives better preoperative preparation than the private admission patient, for the latter as a class have not grasped the importance of hospital rest and careful preparation for the coming ordeal. In the imperative group where emergency surgery is de-

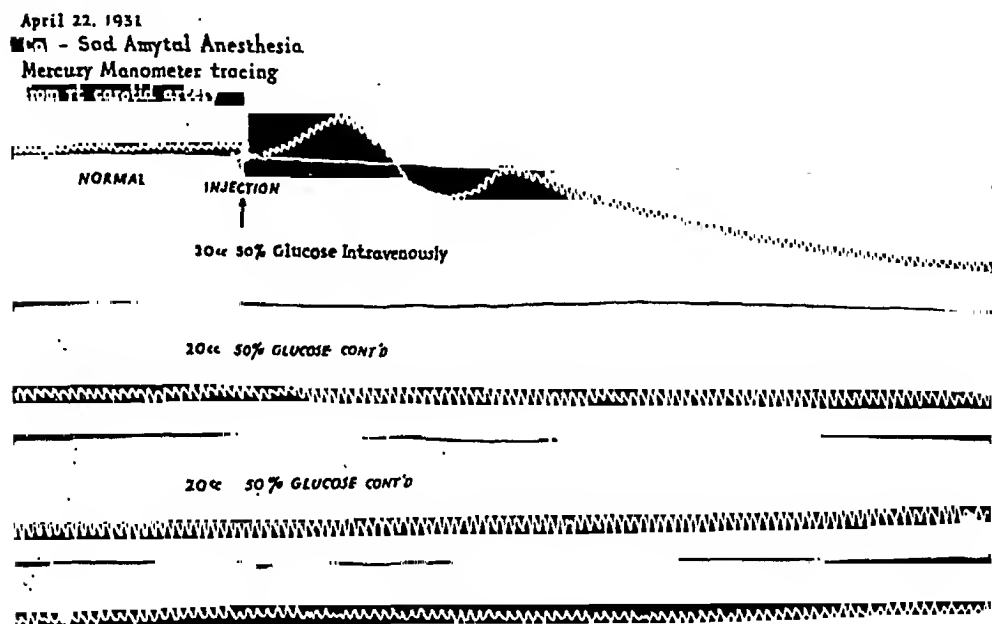


Fig. 1.—Showing response following the injection of 20 c.c. of 50 per cent glucose solution. In the kymograph tracings shown in this and the following figures, the cat was the experimental animal used.

manded, the patient is usually suffering from trauma with its attendant shock, hemorrhage or infection. Blood transfusion, intravenous glucose and subcutaneous saline solution are relied upon to rally the patient's natural defenses. Almost all surgeons use glucose (dextrose) in solution by the duodenal tube, or by intravenous injection or the subcutaneous route to supply food and fluid or to overcome dehydration and acidosis.

It is an accepted physiologic and clinical fact that early restoration of the plasma volume or blood volume in conditions where there has been acute hemorrhage is all important, hence, ready substitutes for direct blood transfusion have been sought. Naturally, the intravenous injection of normal saline solution was first employed. Both

laboratory and clinical evidence shows that while salt solution temporarily raises the systolic pressure and improves the pulse rate, it rapidly leaves the circulation and waterlogs the tissues. To overcome this and maintain the plasma volume in the circulation, solutions of protein, gelatin and acacia have had both experimental and clinical trial.

In 1915, Hogan suggested a 2.5 per cent solution of gelatin and sodium chloride for this purpose. Bayliss, in 1917, recommended a 6 per cent acacia in normal saline solution. This was used by Keith during the world war at a shock center in quantities of 700 to 1,000 c.c. with varying results. In 1921 Farrar and Coburn presented their work with acacia and dextrose before this society. This solution has

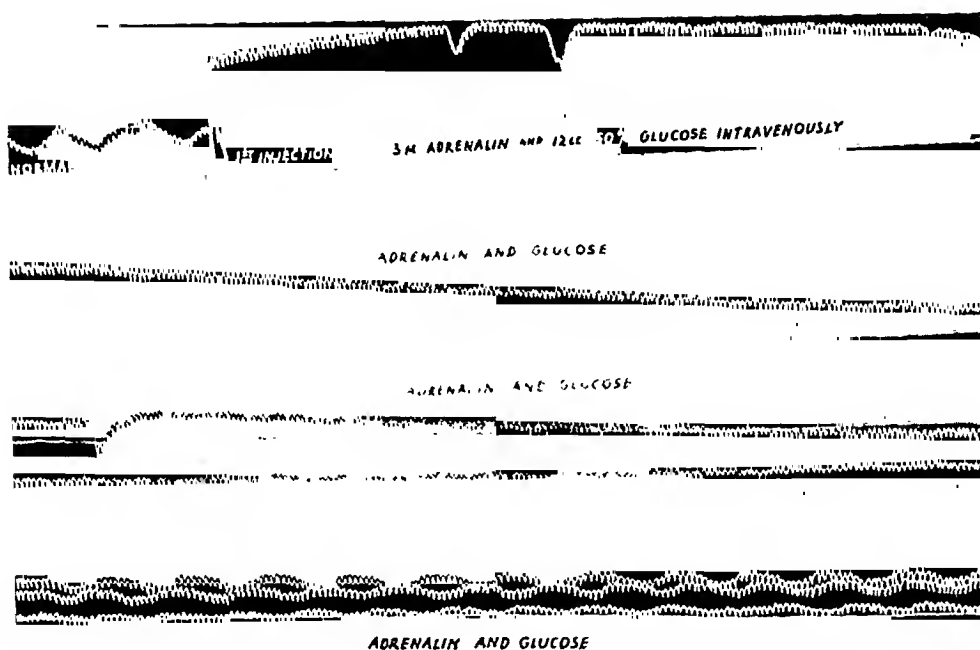


Fig. 2.—Shows effect of adrenalin and glucose solution.

been continuously employed in both the prevention and the treatment of shock at the Woman's Hospital, New York City, for the past ten years.

Huffman at The Mayo Clinic reports 300 cases of shock or shock and hemorrhage treated with a 6 per cent acacia and sodium chloride solution and makes the following comment:

"Gross evidence of toxicity was not seen following the intravenous injection of solution of acacia and sodium chloride in shock. The blood pressure increased, the pulse rate decreased, the respiration deepened and the general condition of the patient improved. The need for transfusion was often obviated. In some cases, increased output of urine was noted. Injurious effects on the kidneys were not seen. Chemical changes in the blood of a harmful nature were not apparent. Physiochemical changes in the blood did not lead to harmful alterations in physiologic processes. Six days is usually required to rid the blood of acacia. Pathologic change resulting from the acacia was not demonstrated at necropsy."

Physiologists tell us that glucose (dextrose) is:

1. A food for the vital organs, especially the liver and heart muscle.
2. That its use temporarily improves the quality of the pulse by improving the ventricular filling of the heart.
3. That it temporarily raises the systolic blood pressure and produces a peripheral circulation by its osmotic effect on tissue fluids.
4. That it promotes diuresis and combats acidosis.
5. That it temporarily lowers body temperature.
6. That it increases the protective power of the blood; and according to Hofbauer it stimulates the production of myelocytes.
7. That it decreases the coagulation time in jaundice patients but increases the clotting time in other patients.
8. That in high concentration it prevents agglutination of the blood and in diabetics, glucose, and insulin effect glycogen storage of the heart.

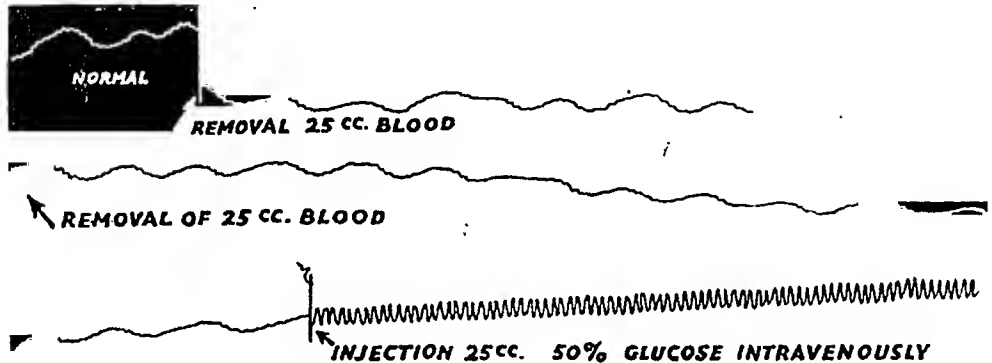


Fig. 3.—Response following the removal of 25 c.c. of blood from the femoral artery and subsequent injection of 25 c.c. of 50 per cent glucose solution.

The three conditions which attend all operations in varying degree are shock, dehydration, and acidosis. In the prevention of shock, concentrated glucose solutions by intravenous injection play an important part, this also holds true in its treatment.

During the past two years we have studied more than 200 cases of primary shock and shock and hemorrhage, all of which have been given a 50 per cent hypertonic glucose solution. In this paper we shall attempt to show by laboratory and clinical evidence that these hypertonic solutions have a therapeutic action on the vital organs of the body by their action on the circulatory system, and that by their proper use the patient can be prepared for the strain of operation and that her postoperative safety, comfort, reaction and resistance are increased.

In any well-developed case of traumatic shock with or without hemorrhage there is a partial suspension of the circulation associated with an actual decrease in the volume of circulating blood. Robertson, Boek and Keith, studying shock in wounded soldiers have demon-

strated an actual diminution in the blood volume, even in the absence of profuse hemorrhage. The diminished blood volume bears a definite relationship to the severity of the patient's condition, but not to the actual amount of blood lost by hemorrhage, for even after considerable bleeding there is a rapid return to normal of the blood plasma volume and the cell volume. If this occurs (this sensitization to the loss of blood), no untoward symptoms develop. When, however, the blood loss continues or is excessive and there is severe trauma besides, a condition of profound shock follows.

In cases of shock in which ultimate recovery takes place there is a gradual restoration of the blood volume and the plasma volume. On

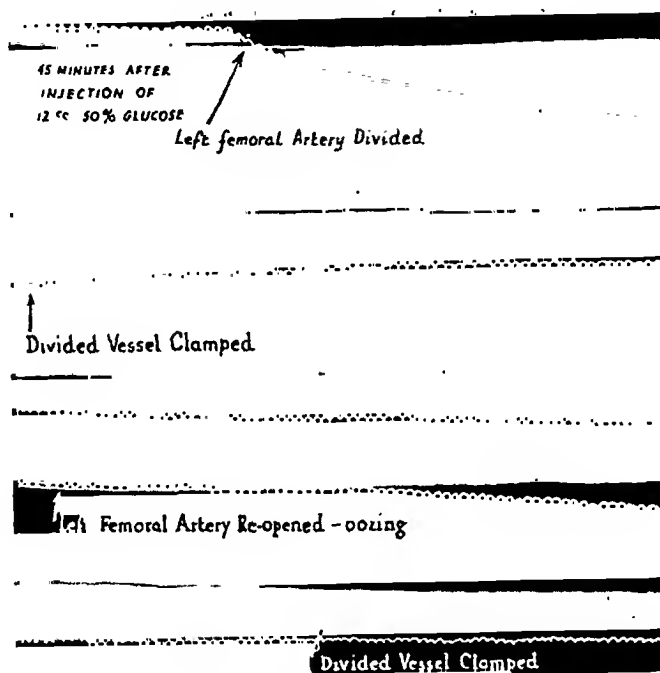


Fig. 4.—Showing response to cutting the left femoral artery after injection of glucose, clamping artery, etc.

the other hand, if there is no increase in the plasma volume, no recovery takes place. This fact emphasizes the importance of aiding early restoration of the plasma volume and the blood volume and maintaining the volume of circulating fluid. Could early blood transfusions be done, they would be the procedure of choice. At this point we must warn that blood transfusion or any intravenous substitute used late in the development of shock is of no avail, it simply overloads a failing heart.

Our experiments on animals show that hypertonic solutions of glucose affect the circulation by acting on the heart muscle, temporarily raise the systolic and pulse pressure and improve and diminish the rate of the pulse by restoration of the blood volume. When concen-

trated glucose is given prior to operation and there is considerable hemorrhage, we note a sharp drop in the systolic pressure with only a gradual fall in the pulse pressure. In contrast similar amounts of blood loss in our controls have been followed by an abrupt fall not only in the systolic but in the pulse pressure as well. After injections of hypertonic glucose, the pulse pressure promptly rises, reaches a maximum in about thirty minutes and after sixty to ninety minutes gradually comes down to the normal. The systolic pressure has a primary fall and gradually increases and remains slightly at a level above normal. The rapidity and duration of its effect is proportionate to the quantity of solution injected, the pulse rate is always diminished. Adrenalin should not be used in shock to raise systolic pressure, for it

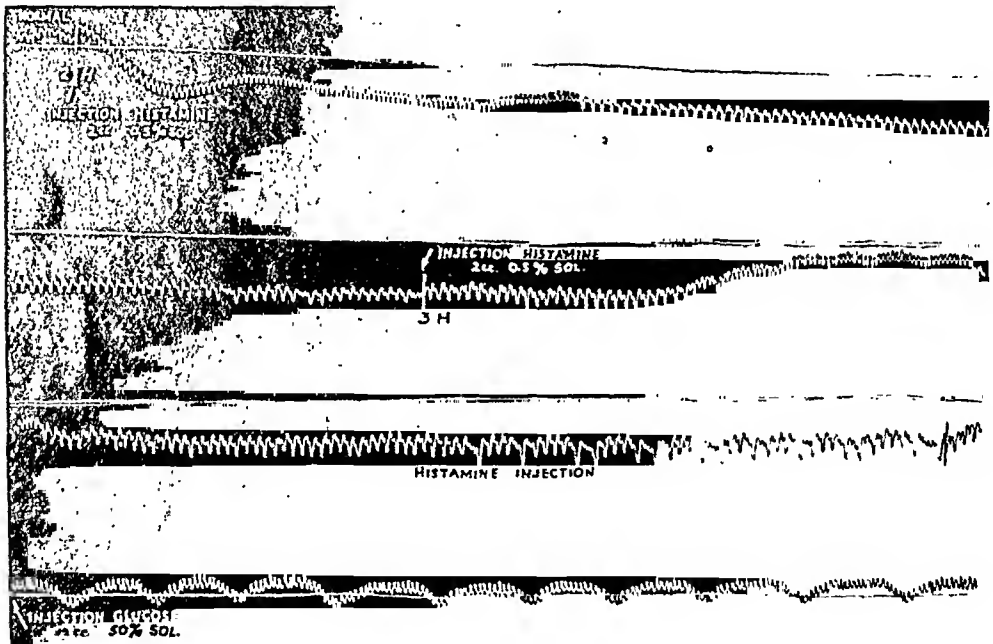


Fig. 5.—Showing response to two successive doses of 2 c.c. each of 0.5 per cent histamine, followed by the injection of 12 c.c. of 50 per cent glucose solution.

does not improve the flow through the capillaries. Nutritive flow through the capillaries all over the body is obtained by increase of the volume flow and hypertonic glucose solution will do this.

Prolonged labor produces muscle fatigue which is shown by the gradual increase in pulse rate, slowing of uterine contractions, tendency of tongue to dry in center, gaseous distention of the abdomen and slight rise of temperature. The patient who shows sign of fatigue, venous stasis, hypotension, leucopenia, dry tongue, and the general picture of lack of circulatory tone, is a poor operative risk besides being a good subject for subsequent thrombosis with fatal embolism. Hypertonic glucose will not only improve the cardiac tone and increase the blood pressure, but will also prevent intravascular clotting.

It increases the phagocytic power of the blood and in cases of sudden hemorrhage where the pulse and the systolic pressure fall, it is noted that this fall is more gradual and the patient's pressures are more readily returned to their normal level after the bleeding has been checked.

One fact has been demonstrated, namely; the tired parturient patient is a bad risk unless she has rest, fluids and carbohydrates, for anesthesia disturbs the balance in the constituents of the protein radi-
cle which has already been disturbed by the pregnancy. Furthermore, it produces acidosis by insufficient oxydation of glucose. In such cases a dose of morphine with or without scopolamine secures both physical and uterine rest, and an intravenous injection of 50 or 100 c.c. of a 50 per cent glucose solution will completely change the patient's appearance, the pulse, the systolic and pulse pressure.

In traumatic shock where the blood pressure falls to a very low reading, the introduction of a 50 or 100 c.c. of a 50 per cent solution of glucose will raise the pressure from 15 to 50 mm. within a period

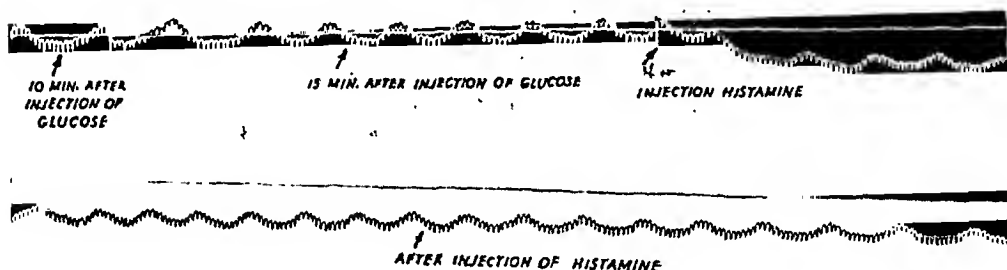


Fig. 6.—Showing response to injection of 2 c.c. of 0.5 per cent histamine fifteen minutes after the injection of 12 c.c. of 50 per cent glucose solution.

of four to five minutes. This rise is maintained from twenty minutes to one-half hour, when there is a slight secondary drop followed by a gradual rise in both the systolic and pulse pressure. These observations have been confirmed in the animal as well as by more than 200 studies in the human being.

Goltz, in 1863, demonstrated that a blow on the exposed mesentery of a suspended frog, caused a reflex inhibition of the heart action through the vagus and lessened the vascular tone throughout the body, especially in the abdominal cavity. This primary shock or collapse has been observed in obstetrics in a few cases of postpartum hemorrhage where for its control the uterus was lifted out of the pelvis and forcibly compressed against the spinal column (posterior abdominal wall). In this series we have had three such cases in which there was severe shock following a moderate loss of blood due to the partially separated placenta. In all, the picture has been typical; a clear mentality, excessively low systolic pressure, terminal cyanosis and general vasomotor collapse. In each case, repeated small injec-

tions of a 50 per cent glucose improved the condition and speeded the woman on to recovery.

Our laboratory studies show that in traumatic shock where the blood pressure falls to a very low reading, the introduction of a small quantity of concentrated dextrose solution, will raise the systolic pressure from 15 to 30 mm. within a period of four to five minutes, then there is a secondary drop which is followed by a gradual rise, so that at the end of half an hour the systolic pressure is maintained.

Clinically, in the human being, these observations have been confirmed. In a recent case in which the splanchnic ganglia were severely traumatized in packing the sigmoid with gauze prior to a Coffey operation for transplantation of the ureters, the patient went into severe traumatic shock, became pulseless, bathed in cold perspiration and the systolic pressure fell from 170 to 40. No diastolic pressure could be recorded. Within six minutes after the introduction of 50 c.c. of a 50 per cent solution of glucose, the radial pulse could be counted, the skin became slightly flushed, the systolic pressure rose to 110, and continued to rise during the next half hour to 130 and was maintained at that level.

In the postoperative routine followed out in most hospitals, it is the custom to use large quantities of normal saline solution by enteroclysis or by hypodermoclysis. The efficiency of this addition of chlorides can be materially augmented by improving the circulatory action by intravenous instillations of concentrated glucose solutions. We hold no brief for glucose as a substitute for whole blood in hemorrhage or in shock, or in the exhausted patient, but experience has taught us that in shock with or without hemorrhage, it is to be commended. Active treatment must be instituted before there is complete circulatory collapse. The patient who receives prompt treatment is the one who recovers. This is proved in our experience in treating the hemorrhages of pregnancy such as ablatio and placenta previa. We find that in both of these conditions, the patients are able to sensitize themselves to a moderate amount of blood loss, but will not stand further loss of blood or any operative procedure. On the other hand, if we transfuse these patients prior to operation and anesthesia, the subsequent picture is quite different and they stand their procedure well. Where blood is not available or where time is pressing, concentrated glucose solution makes an excellent substitute.

We can say with all positiveness that concentrated glucose is a valuable adjunct to preoperative preparation. It maintains pulse pressure, causes a slight rise in the systolic pressure and, if repeated, prevents a fall. In hyperemesis of pregnancy it supplies sufficient carbohydrate to carry the patient over to the time when diuresis is established. That it diminishes postoperative vomiting and that it has extensive value as a food in the presence of peritoneal infection.

From this study we feel justified in drawing the following conclusions:

1. That shock, dehydration and acidosis are preventable in the majority of cases.

2. That in shock the plasma volume and cell volume must be restored.

3. That this can be restored by prompt treatment, either by direct transfusion or by the intravenous injection of hypertonic glucose solutions.

4. That the blood chemistry is but temporarily changed when relatively large quantities of concentrated glucose are used and that the excess is spilled over into the urine.

5. That intravenous injections of hypertonic glucose definitely raise blood pressure and pulse pressure and increase the circulating volume of blood.

Acknowledgment is due to Professors J. C. Caldwell and George Roberts of the Department of Physiology, Long Island College Hospital for their checking and reviewing of our experimental data.

20 LIVINGSTON STREET.

Meyer, J. F.: The Elimination of Dyes by the Uterine Mucosa. *J. Lab. & Clin. Med.* 14: 936, 1929.

Meyer, in a series of experiments on dogs, injected the saphenous vein with aqueous solutions of mercurochrome, pyridium, acriflavine, methylene blue and gentian violet. The object of the experiment was to determine, if possible, the absorption and subsequent excretion of these dyes when used intravenously as genital antiseptics. Pregnant, puerperal and nonpregnant animals were used; the dye was first injected under anesthesia and the uterus removed almost immediately following injection. The results of this first series were inconstant and were, therefore, discarded. In another series, the injections were made without anesthesia and four hours later the uteri were extirpated under anesthesia. The endometria were then examined without further staining. It was found that mercurochrome, pyridium and acriflavine gave a distinct color to the uterine mucosa; gentian violet was questionable and methylene blue did not color the mucosa at all. It was found also that the physiologic state of the endometrium did not influence the elimination of the dye.

The experiments suggest that there is a rational basis for the study of systemic chemotherapy of local disease in the female genital tract.

W. B. SERBIN.

PELVIC ENDOMETRIOSIS*

SPONTANEOUS RUPTURE OF ENDOMETRIAL CYSTS, WITH A REPORT OF THREE CASES

BY EMIL NOVAK, M.D., BALTIMORE, MD.

(From the Gynecological Department, Johns Hopkins Medical School)

THERE is no gynecologic disease which has excited more interest and discussion in recent years than has pelvic endometriosis. It had long been known that islands of aberrant endometrium occasionally are observed in various locations in the pelvis, more especially in the ovaries, but their frequency, significance, and importance were not appreciated, and they were passed by rather casually as curious but unimportant instances of embryonic misplacement of tissue. It remained for Sampson¹ to piece these scattered observations together, to study his own material systematically and intensively, and to present the lesion as a very definite and important entity; both pathologically and clinically.

The chief characteristics of pelvic endometriosis are now so well known that they need not be discussed here except in a rather summarizing fashion. The aberrant endometrial tissue may be found in many different locations, such as the ovary, the posterior surface of the uterus (rarely the anterior), the uterine ligaments (broad, uterosacral or round), the anterior surface of the rectum, the sigmoid, the appendix, the rectovaginal septum, the vagina, the vulva, the anterior abdominal wall, and the umbilicus. In some cases the aberrant endometrium may occur as only a single small, perhaps microscopic area, with no symptoms referable to its presence; in others its distribution in the pelvis may be widespread, giving rise to serious clinical symptoms. It should be stated, however, that these more serious cases constitute only a small minority of all those observed, and that on the other hand, in a rather large proportion, the finding of endometriosis has a significance which is scarcely more than academic, being associated with no important clinical symptoms.

Between these two extremes, again, is a large group in which troublesome symptoms are noted, not unlike those of the ordinary type of chronic pelvic inflammatory disease. Among these are discomfort in the lower abdomen, dysmenorrhea, not infrequently menorrhagia, sacral backache, and sterility. A symptom of great importance, in my own experience, is rectal pain during menstruation. The obvious explanation for this, of course, is the fact that in most cases of endo-

*Read before the Annual Meeting, Southern Surgical Association, December 11, 1930, Lexington, Kentucky.

metriosis there are nodular deposits of endometrial tissue in the region of the uterosacral ligaments, and that these undergo premenstrual and menstrual swelling, causing pain referred to the rectum, upon which they impinge.

The findings on physical examination depend on the type of case found. In the variety just described, the one most often found clinically, bimanual examination is apt to give findings quite similar to those of chronic pelvic inflammation except for one feature. As with chronic salpingitis, a somewhat tender mass, usually not large, is felt in one or both sides of the pelvis, while the uterus is apt to be rather fixed, and not infrequently retrodisplaced. Unlike simple inflammatory disease, however, endometriosis is often associated with the presence of one or more nodules, which can be readily palpated behind the cervix, either by vaginal or rectal examination. These nodules are usually small, varying from that of a buckshot to that of a cherry. They represent, of course, the endometrial deposits above alluded to, and are quite characteristic of endometriosis. Their presence in a case which otherwise suggests chronic pelvic inflammatory disease is extremely suggestive of pelvic endometriosis. This point of diagnosis has been emphasized by a number of writers (Cullen,² Keene and Kimbrough,³ King⁴). For a complete review of the clinical characteristics of endometriosis, the reader may be referred to the recent excellent paper of Keene and Kimbrough.³

Etiology.—Although the clinical characteristics of pelvic endometriosis may be considered well established, there is still much discussion as to its etiology and as to the histogenesis of the aberrant endometrial tissue. All of the explanations which have been offered must still be looked upon as only theories, for none has as yet been clearly established. Indeed, scientific proof of some of them seems almost impossible because of the very nature of the problem. The evidence for or against the correctness of these various theories is of necessity largely circumstantial, so that each student of the subject must make himself a judge as to which viewpoint is supported by the strongest evidence. Investigators have apparently worked themselves into a scientific culdesac from which they can be rescued only by the discovery of some new method of attacking the problem. Only a brief summarizing review of the question will be attempted in this paper.

*Sampson's Theory of Transtubal Implantation.*¹—This theory, now widely known, is based upon the fact that at times menstrual blood regurgitates through the tubes into the pelvic cavity, especially if there is any obstruction to its passage through the cervical os, such as might presumably be produced by retrodisplacements or uterine myomatous tumors. Such a regurgitation of blood, carrying with it particles of endometrium, may result in the implantation of these particles on the ovaries or the pelvic peritoneum. The implanted

endometrial particles tend to invade the tissues, often producing in the ovaries endometrial or chocolate cysts, filled with menstrual blood, inasmuch as the aberrant endometrium retains the physiologic attributes of normal endometrium. These endometrial cysts are characterized by a tendency to perforate, the spill carrying with it particles of endometrium, which again plant themselves wherever they fall, especially on the posterior surface of the uterus, the anterior surface of the rectum, and the culdesac of Douglas.

Whether right or wrong, the theory has stimulated an enormous amount of work and discussion on this hitherto overlooked subject. There is much circumstantial evidence in its favor. For example, there is the fact that the tubes in cases of endometriosis are commonly patent, and the further fact that the aberrant islands are most characteristically in just the locations one would expect if they arise from endometrial "seed" dropped from the end of the tube.

On the other hand, many question the rôle of menstrual regurgitation in the production of the pelvic endometriosis, and, in truth, it would seem hard to believe, *a priori*, that a physiologic process, like menstruation, should so often produce a by-product so pathologic, and at times so serious in its effects, as endometriosis. While menstrual regurgitation may undoubtedly occur, it is certainly not very common. In a considerable number of operations upon menstruating women, I had personally never observed it, even though it was carefully looked for, until recently, when I found it possible to milk out a small amount of blood from the fimbriated extremity of the tube in a patient who had begun to menstruate the day before operation.

Furthermore, even granting the occasional backward flow of menstrual blood, and conceding that it may, as Sampson says, contain small amounts of cast-off endometrium, no proof has as yet been offered that such endometrium is viable and that it can implant itself upon the ovary or pelvic peritoneum and grow. Histologic studies upon the endometrium of the menstruating uterus, such as those made by TeLinde and myself,⁵ make it difficult to believe that this could occur, for, even before it is cast off, the endometrium is obviously dying. Furthermore, there is abundant evidence that, after being cast off, the tissue particles undergo rapid degeneration and autolysis. These facts, together with many others, I have presented in extenso in a previous paper.⁶

After all, a direct proof of the probable correctness of Sampson's theory would necessitate experimental proof by one of two methods, viz., the demonstration that endometrial particles cast off at menstruation can grow on the peritoneum, or the proof that successful tissue cultures can be made from such cast-off particles. Efforts have been made along both lines, but the results have been very unimpressive. A number of investigators, particularly Jacobson,⁷ have appar-

ently been able to produce in animals a growth of endometrium (non-menstrual) upon the peritoneum, though in many of the experiments the similarity of these growths to the original endometrium was questionable. No one, so far as I know, has been able to grow menstruating endometrium on the peritoneum, and, indeed, such efforts would seem to be foreordained to failure, for technical reasons.

Nor, with only one apparent exception, so far as I know, has anyone been able to grow menstruating endometrium in tissue culture. This exception is noted in the work of Cron and Gey,⁸ but the conditions of the experiment make it seem likely that the tissue included also portions of the active basal, nondesquamating layers, from which growth might logically be expected.

The fact that many monkeys menstruate like the human female, exhibiting exactly the same endometrial and ovarian changes, would suggest that in these animals, and in them alone, could the problem be attacked very directly. So far only Heim⁹ has published studies along these lines, and, while they were carried out on only a small series of animals, they appear to speak strongly against Sampson's views. Desquamating menstrual mucosa from both the monkey and the human female could not be made to grow on the peritoneum, while pelvic endometriosis in the monkey could not be produced by the creation of a uteroabdominal fistula which permitted free leakage of menstrual blood from the uterus into the pelvis.

An obvious objection to the original theory of transtubal implantation is that it cannot possibly explain the occurrence of aberrant endometrium in certain regions, such as the umbilicus, so that Sampson himself, in his later papers, has stated his belief that different explanations must be invoked for different cases of endometriosis. Furthermore, the original implantation theory itself would not seem to explain why the implants are practically always confined to the pelvic peritoneum. The latter must possess some special receptivity to the implants, for, unlike cancer, they rarely, if ever, occur in the peritoneum, for example, of the small intestine, even though the latter must, in almost all cases, come into contact with the disease area. The sensitizing influence must be of physiologic nature, probably bound up with the internal secretion of the female gonads. Certainly, however, the mere mechanical dropping of the endometrial seed is not sufficient to cause endometriosis, unless the soil is suitable. With Sampson's theory, therefore, as with practically all the theories as yet offered, recourse must be had to other as yet unproved hypotheses to make out a logical case.

The Theory of Serosal (Celomic) Heteroplasia.—This theory, originally suggested by Iwanoff,¹⁰ with Meyer¹¹ as its strongest champion, has been accepted, in one form or another, by many of those interested in the problem. In a preceding paper, already alluded to,⁶ I brought

forth the reasons which, to me, make it more acceptable than the one already discussed, although, like the latter, it is not susceptible of proof by any direct method now available.

This theory takes as its point of departure the embryologic fact that the lining mucous membrane of all parts of the mullerian canal (tubes, uterus, and vagina), as well as the germinal epithelium of the ovary and the pelvic peritoneum, are all derived from the same parent tissue, i.e., the celomic epithelium. An invagination of the latter gives rise to the muellerian mucous membrane, so that the latter, in all its parts, may be looked upon as only a modified peritoneum, carried to different phases of differentiation in different segments of the canal. Some of the less highly differentiated portions, like the germinal epithelium, still retain a greater or less degree of unused differentiating potency, so that they may, under appropriate stimuli in later life, be excited to further differentiation into, for example, endometrium or tubal mucosa. This is not a merely fanciful hypothesis, but is based upon good embryologic grounds, and has the support of such eminent embryologists as Fischel.¹²

Whether all the cells of such tissues as the germinal epithelium and the pelvic peritoneum retain this capacity for further differentiation, or whether this capacity is limited only to certain undifferentiated or basal cells, as Meyer and others believe, may be considered questions of detail, as yet unanswerable. If the general principle holds good, an explanation is at once offered for practically all types of endometriosis, including those in such extrapelvic regions as the navel, the groin, the labia, etc. For example, the common persistence of celomic remnants at the umbilicus would explain the occasional presence of endometrium in this region. Again, the frequent persistence of vestiges of the processus vaginalis (canal of Nuck) would throw light on the occurrence of endometrial nodules in the groin or in the labia.

As with the regurgitation theory, so with that of celomic heteroplasia, the criticism of incompleteness is an obvious one. What are the stimuli involved in inciting the further differentiation of such tissues as the germinal epithelium or the pelvic peritoneum into actual endometrium? I do not believe that this question can be answered until we know much more than we now know as to the forces behind the normal differentiation of tissue elements in the development of the fetus. Presumably they are chiefly of endocrine nature. The only other explanation would be that an adventitious factor is added by some substance emanating from the ends of the tube. Whether this is menstrual blood or whether, perhaps, it is something secreted by the so-called secretory cells of the tubes, is of course a matter of speculation only, in the present stage of our knowledge.

The fact that scattered areas of the pelvic peritoneum may possess a special sensitivity to ovarian influences and may often react in an endometrium-like fashion is indicated by the frequent observation during pregnancy of islands of decidua on the posterior surface of the uterus, the broad ligaments, the ovarian surface, and elsewhere in the pelvis. It is of interest to note that the distribution of these decidual plaques is almost identical with that of endometriosis. The frequency of ectopic decidua in the ovary, like that of ovarian endometriosis, is rather great, Williams¹³ finding it in one of every three or four cesarean sections. It should be stressed that in such cases there is ordinarily no indication, from the local conditions found, that we are dealing with a decidual transformation of previously implanted endometrium.

Other Theories.—Mere mention may be made of two other explanations which have been offered for endometriosis. Halban,¹⁴ supported chiefly by Mestitz,¹⁵ believes that the islands of aberrant endometrium are due to the lodging, at various points in the pelvis, of particles of endometrium which have been taken up by the uterine lymphatics during the desquamation characteristic of menstruation. While such embolism may occur, and while endometrial tissue, in a small group of cases, has been found in the regional glands, this theory seems untenable. Among other things, the distribution of the endometrial islands is not what one would expect if lymphatic metastasis were the chief factor involved. Similar emboli of endometrium have been occasionally found in the venous channels by Sampson and others, and Sampson is willing to accept the view that some cases of endometriosis may be produced through this mechanism. But its relative importance must be slight.

The same may be said of Schiller's view¹⁶ that the endometrium is the result of metaplasia of the lymphatic endothelium, in spite of the fact that polyp-like growths resembling endometrium may at times be found in the uterine or ovarian lymphatics.

Summary as to Etiology and Histogenesis.—From what has been said, it is seen that the evidence in favor of any of the various theories is so incomplete that it would ill behoove any of us to be dogmatic in the support of any one of them, or to be too unsympathetic toward the others. Each student of the subject will be inclined toward that theory which to him seems supported by the strongest evidence. The general factor of plausibility is of course a subjective one, and when dealing with evidence which is so largely circumstantial, gynecologists will differ on this point just as jurymen differ in their reactions toward evidence produced in court.

My own interpretation of this evidence, in the case of endometriosis, would be that the celomic heteroplasia theory explains the lesions more logically and has wider applicability than any other, in so far

as the actual cause is concerned, but that implantation must, almost certainly, play a part in the dissemination of the process once it has been begun. In other words, I do not believe that endometrial cysts are the result of implantation of tissue carried from the uterus through the tubes at menstruation, but rather that some other factor brings about the further differentiation of germinal epithelium into endometrium. On the other hand, once endometrial cysts have developed in the ovary, their frequent perforation, with the setting free of tissue which in this case may be viable, together with the direct invasive growth of endometrium into adherent adjacent tissues, would seem to offer a logical explanation for the common clinical pictures found. It is quite possible, however, that Sampson's original explanation is the correct one, or that the view of a manifold etiology, held by many, is correct.

Frequent Misapplication of the Term "Chocolate Cyst."—The designation "chocolate cyst" is an expressive one, but it is frequently misapplied, sometimes even grotesquely. It was applied by Sampson to cysts of the endometrial type, because of the characteristic chocolate-like appearance of their contents. It is not unusual, however, to hear the term used for cysts of almost any type when the contents happen to be dark and hemorrhagic, as is so often the case. I recently heard a surgeon speak of removing a "chocolate cyst" which filled the whole abdominal cavity, and which was evidently a cystadenoma with hemorrhagic contents. Such errors will not be made by surgeons who are at all familiar with the pathologic characteristics of genuine endometrial cysts. Similarly, ovarian hematomas of follicular or corpus luteum origin are often wrongly spoken of as chocolate cysts, though here again there need rarely be any difficulty in making the differentiation, even without microscopic examination. To avoid confusion, however, it would certainly seem that the designation of "endometrial cysts" is a much better one than "chocolate cysts," to indicate the lesion under discussion.

The Perforative Tendency of Endometrial Cysts.—Another term applied by Sampson to endometrial cysts is "perforative cysts," because of their tendency to perforate when still quite small, with dissemination of the aberrant endometrium through the spill of their contents. While such perforations are difficult of demonstration, their probability is indicated by the distribution of the islands of aberrant endometrium. For example, a common picture in pelvic endometriosis is that of the small endometrial cyst in one or both ovaries, with fixation of the latter to the posterior surface of the broad ligament or uterus, and a cluster of hemorrhagic endometrial nodules in the region of the uterosacral ligaments. It seems highly probable, though not perhaps scientifically certain, that the uterosacral islands are the result of implantation of endometrial seed dropped from the endometrial cysts

in the ovaries. When these cysts are peeled from the surface of the uterus or broad ligaments, they almost invariably rupture, suggesting a previous perforation, with subsequent matting of the structures at the point of perforation.

The physiologic hemorrhage which takes place from the endometrial lining of the cysts at the menstrual periods would seem to offer the logical explanation for this perforative tendency, associated as it must be with an increased tension of the cyst contents. Moreover, it should not be forgotten that the endometrial tissue has a strongly invasive tendency, especially when brought into contact with adhering structures, such as the uterine wall. The common rupture of the cysts when they are separated from the uterus and broad ligament is no doubt due in large part to the friability of this stratum of endometrial tissue in the line of cleavage.

If perforation of these cysts is really as common as is generally believed, it seems strange that the history so rarely reveals any of the symptoms which we are so accustomed to associate with intraperitoneal hemorrhages. This may be due in part to the lessened sensibility of the deep pelvic peritoneum as contrasted with that at higher levels. A more likely explanation, however, would be that the perforations are probably very minute, perhaps of the pinpoint type, so that the escape of contents is a slow and seeping one. This permits of a walling off through the peritoneal reactive inflammation set up by the menstrual blood which escapes, with the formation of the extensive adhesions which are found in so many cases of marked endometriosis.

When, as occasionally happens, an endometrial cyst reaches a large size, the possibility of perforation would seem to be much greater than in the small cysts far more frequently observed. In the first place, the expanse of endometrial surface is much greater, so that the amount of intracystic menstrual hemorrhage must be quite large, with corresponding increase in tension. In the second place, such large cysts, lifting themselves from the pelvis and developing a more or less defined pedicle, are far more prone to the disturbances of circulation commonly seen with partial or complete twisting of the pedicle. The venous circulation is much more likely to be interfered with, the pressure within the cyst being thereby increased.

When rupture of a larger cyst occurs, the break in the cyst wall might be expected to be larger and the amount of cyst contents likewise much greater than with the small cysts. It would be surprising, therefore, if this more abrupt and more massive escape of contents were not associated with acute intraperitoneal symptoms.

These considerations are set forth in a retrospective way through the observation of three cases in which the spontaneous rupture of unusually large endometrial cysts was actually accompanied by very acute symptoms, which, in two of these three instances, resembled un-

usually acute appendicitis. All three of these patients were found in one year, and the symptoms, as well as the pathologic findings, were almost identical. For this reason, I have been impelled to call attention to the condition, infrequent though it must be. In fact, I have been able to find only one other case of this type in the literature, though even this is open to question. I have no doubt, however, that others have been observed, and perhaps even recorded, without recognition of the endometrial nature of the cyst lining. This would apply particularly to those reported before the publication of Sampson's first paper, in 1921.

In 1929 Lee¹⁷ reported, very briefly, a case of spontaneous rupture of a cyst containing chocolate-colored material, the occurrence being associated with acute abdominal symptoms. The patient was twenty years old, and her menstrual period had just terminated. Free chocolate-colored, bloody fluid was found as soon as the abdomen was opened. A cyst measuring 8 cm. in diameter was found, adherent at its lower pole to the posterior wall of the uterus and broad ligament. Pressure on the cyst caused the escape of a further amount of the same fluid. Unfortunately no mention is made of histologic findings, although it seems almost certain that the case belongs in the category under discussion.

The three cases of which I am appending a brief summary presented surprisingly similar clinical symptoms as well as pathologic findings, so that one description would almost fit all three.

CASE 1.—A. W., aged thirty-eight para ii, had suffered for three years with frequent attacks of severe pain in both lower quadrants. These attacks came usually a day or two before or during the periods. Menstruation had been normal in amount and rhythm, except that for two years the intervals had been three instead of four weeks, as formerly. There had been no pregnancy for eleven years. Two days before admission, and one day after the onset of a menstrual period, an unusually violent attack had occurred, with pain chiefly in the left lower abdomen, but referred also to the gall bladder region. There had been nausea, with some vomiting. Pain was still severe when the patient entered my service at St. Agnes' Hospital.

Examination.—The patient was an obese woman, weighing about 210 pounds, and evidently suffering severe pain. The temperature was only slightly elevated (99.8° F.), with a pulse of 98. The blood count showed only 7500 white blood cells. There was marked tenderness, with some rigidity, over the whole left lower quadrant, with some also in the right iliac fossa, but none in the upper abdomen. Pelvic examination showed a normal cervix, with a uterus above average size, presumably because of the presence of myomatous tumors, two nodules being distinctly palpable in the anterior wall. There was extreme tenderness in the left side of the pelvis, with indefinite thickening, but no clearly defined mass. The right side was also tender, but here also no marked enlargement could be made out. There were no nodules present in the uterosacral region.

Impression.—Myoma of uterus; probable ovarian cyst with twisted pedicle.

Operation.—Feb. 24, 1930. On opening the abdomen, through a median supra-pubic incision, a small amount of thick chocolate-colored fluid at once escaped, and

several ounces more were found free in the abdomen. The omentum was heavily pigmented, being of a dirty bluish-green hue. The uterus showed several small myomatous nodules. The left ovary was replaced by a soft, semicollapsed cyst about the size of a large orange. There was no point of rupture to be seen at the upper pole of the cyst, but when it was loosened at its lower pole, which was very adherent to the back of the uterus, there was a gush of contents exactly similar to the fluid found free in the abdomen and pelvis. There was a small "chocolate" cyst in the right ovary. The adnexa of both sides were extensively adherent, though the fimbriated ends of the tube were patent. Supravaginal hysterectomy, double salpingo-oophorectomy, and appendectomy were performed.

Pathologic examination showed both ovarian cysts to be lined, though imperfectly, by typical endometrium. The rupture of the cyst had evidently taken place at the lower pole, though the opening had sealed over so thoroughly that it could not be clearly distinguished. A small amount of endometrium was also found on the posterior surface of the uterus and at the tip of the appendix.

CASE 2.—L. K., aged thirty-seven, single, had had severe attacks of pain, lasting from one hour to two days, at irregular intervals for the previous year. Most often these attacks occurred on the second day of the menstrual flow, though at times also between the periods, which were otherwise quite normal. The pain was always referred to the right lower abdomen. The present attack began thirty-six hours before admission, with lower right abdominal pain, and severe vomiting. The temperature on admission was 99° F., pulse 90, and there was a slight leucocytosis (11,000 W.B.C.). The last menstrual period had occurred on May 5.

Examination.—The patient was still suffering severe pain. There was marked tenderness, as well as definite rigidity, over the whole right lower quadrant, with some extension to the left side.

Pelvic examination showed a firm nulliparous cervix, pointing downward and backward. To the left of the cervix, filling the left side of the pelvis, was a hard nodular mass, evidently a myomatous tumor, with several smaller masses in the fundus. There was much tenderness, but no mass to be felt, in the right side of the pelvis.

Impression.—Acute appendicitis; myoma of uterus.

Operation.—May 29, 1930. On approaching the peritoneum, through a midline incision, its dark hemorrhagic appearance at once suggested intraperitoneal bleeding. As soon as the peritoneum was incised a large amount of dark, unclotted, bloody fluid escaped. The uterus was the seat of multiple myomatous tumors. The source of the bloody, chocolate-colored fluid was evidently a flaccid cyst of the right ovary, about the size of a baseball. The findings were otherwise almost identical with those noted in Case 1, except that the left ovary appeared grossly normal. The appendix was retrocecal and adherent, but not acutely inflamed. Because of the probably endometrial nature of the cyst and the fact that the patient was approaching the menopause, radical operation was considered advisable, and supravaginal hysterectomy, double salpingo-oophorectomy, and appendectomy were accordingly performed.

Pathologic examination showed undoubted endometrial tissue in the lining of the ruptured cyst wall.

CASE 3.—M. B., aged twenty-eight, widow, para i, had had several mild attacks of pain in the right lower abdomen, none associated with the menstrual periods, which had been quite normal. The last period had occurred two weeks previously. Shortly after arising in the morning, she had been taken with violent pain in the right lower abdomen, with persistent vomiting. The temperature was only slightly elevated (99.5° F.), with a pulse of 100, but the leucocyte count was 14,000.

Examination.—The patient was extremely obese, weighing about 235 pounds.

There was extreme tenderness and rigidity over the whole right lower abdomen, although the patient complained also of pain in the epigastrium.

Pelvic examination yielded no noteworthy findings, although there was considerable tenderness in the right side of the pelvis. The great thickness of the abdominal walls, however, coupled with the tenderness and rigidity, made the examination rather unsatisfactory. The uterus was normal in size and position.

Impression.—Acute appendicitis.

Operation.—May 10, 1929. The operation was performed at St. Agnes' Hospital by my colleague, Dr. J. K. B. E. Seegar, to whom I am indebted for the opportunity of seeing the patient before operation, and for the privilege of making the pathologic study. As in the other two cases, the abdomen contained a large quantity of chocolate-colored fluid, and, as in those cases, the source was evidently a partially collapsed hemorrhagic cyst of the ovary (right). The uterus and the left adnexa were described as normal, so that only right salpingo-oophorectomy was done, with appendectomy.

Pathologic Examination showed the same incomplete but typically endometrial cyst lining as in the other two cases.

COMMENT

In Case 1 the history of many previous attacks of severe pain, always associated with menstruation, suggests that the patient may have had many previous slight perforations at the menstrual periods, though this cannot be considered certain. In the case reported by Lee there was also an association between the menstrual date and the time of rupture of the cyst. On the other hand, in my Cases 2 and 3, no such association was made out. It is of interest to note that in none of my three cases were there present the uterosacral nodules which so often help us in the differential diagnosis of endometriosis, nor, presumably for this reason, had any of the patients observed rectal discomfort during the menstrual periods. The very fact that the cysts had reached such large size may have been the explanation of this. In other words, for some reason they had not perforated and reperforated when small, as is commonly the case, so that endometrial tissue had not been strewn about the pelvis.

SUMMARY

After a review of the clinical aspects and a discussion of the etiology and histogenesis of pelvic endometriosis, three cases are reported, and a fourth cited from the literature, of spontaneous perforation of unusually large endometrial cysts, with the production of acute abdominal symptoms. In two these suggested acute appendicitis, in the third a presumptive diagnosis had been made of ovarian cyst with twisted pedicle. In Lee's case the symptoms had suggested "ectopic pregnancy or acute peritonitis." The possibility of this accident should be borne in mind when acute abdominal symptoms develop in cases in which the history and the pelvic findings suggest the probability of pelvic endometriosis.

REFERENCES

- (1) *Sampson*: Arch. Surg. 3: 245, 1921; AM. J. OBST. & GYNEC. 4: 451, 1922; Arch. Surg. 5: 217, 1922; Boston M. & S. J. 186: 445, 1922; Surg. Gynec. Obst. 38: 287, 1924; AM. J. OBST. & GYNEC. 10: 1, 1925. (2) *Cullen*: J. A. M. A. 67: 401, 1916. (3) *Kcene and Kimbrough*: South. M. J. 22: 101, 1929. (4) *King*: Brit. M. J. 2: 573, 1924. (5) *Novak and TeLinde*: J. A. M. A. 83: 900, 1924. (6) *Novak*: AM. J. OBST. & GYNEC. 12: 484, 1926. (7) *Jacobson*: Arch. Surg. 5: 281, 1922; Arch. Path. & Lab. Med. 1: 169, 1926. (8) *Cron and Gey*: AM. J. OBST. & GYNEC. 13: 645, 1927. (9) *Heim*: Beiheft z. Monatschr. f. Geburtsh. u. Gynäk. 105: 1929. (10) *Iwanoff*: Monatschr. f. Geburtsh. u. Gynäk. 7: 295, 1898. (11) *Meyer*: Arch. f. path. Anat. 195: 487, 1909. (12) *Fischel*: Wien. klin. Wchnschr. 35: 355, 1922. (13) *Williams*: Obstetrics, ed. 6, 1930, D. Appleton & Co., p. 202. (14) *Halban*: Arch. f. Gynäk. 124: 457, 1925. (15) *Mestitz*: Arch. f. Gynäk. 130: 667, 1927. (16) *Schüller*: Arch. f. Gynäk. 129: 425, 1927. (17) *Lee*: Med. J. Australia 1: 19, 1929.

26 EAST PRESTON STREET.

PRIMARY EPITHELIOMA OF THE VAGINA

BY L. MARY MOENCH, M.D., ROCHESTER, MINN.

(From the Division of Medicine, The Mayo Clinic)

PRIMARY epithelioma of the vagina is rare. Less than 1 per cent of all carcinomas of women are said to be of vaginal origin. In The Mayo Clinic, between the years 1915 and 1925, the proportion of vaginal epitheliomas to cervical carcinomas was as 29 is to 1,246, or approximately forty-three cases of cervical to one case of vaginal carcinoma.

Stacy, in 1921, studied a series of cases (reported in 1922) seen at The Mayo Clinic. She noted that only three cases had been reported in the American literature previously. Also in 1921 Bailey and Bagg reported the results of treatment in a series of sixteen cases of primary carcinoma of the vagina; four of the patients were living, apparently free of the disease, at the end of two years. The clinical aspects of these cases, however, were not given. Tuft, in 1930, reported a case of primary squamous-cell carcinoma complicating late pregnancy; the patient was aged sixteen years. Ritchie, in 1929, presented a case of primary carcinoma following a Baldwin operation for congenital absence of the vagina. The malignancy in this case developed after marriage, and although it must be classed as a case of carcinoma of the small bowel, from a segment of which the vagina was constructed, rather than of the vagina, it is of interest as indicating the possible part irritation or trauma plays in the development of malignancy in this situation.

Two forms of early lesion occur. One of them simulates a benign papilloma so closely that microscopic examination must be depended on for diagnosis. A single papilloma with an indurated base should be considered as possibly malignant, until it is proved otherwise by biopsy. A soft, proliferating, friable mass develops as a later stage of the growth and is more easily recognized clinically as being malignant. The second form of the initial lesion, in an early stage, may appear as a small, firm nodule, which in a later stage breaks down into an ulcer,

with a characteristically firm margin, suggesting in some respects a syphilitic lesion. If the dark-field examination is negative, biopsy should be performed. Although the early lesion often appears clinically insignificant, microscopic study reveals the growth to consist, in the majority of cases, of an undifferentiated, rapidly growing type of cell, of malignancy graded 4 by Broders' method, a classification which is further substantiated by the rapidly progressive clinical course of the disease.

The highly undifferentiated type of cell which is characteristic of the majority of these growths is not the only important cause for the rapid course of this disease. The vagina is richly supplied with lymph channels, and fairly early metastasis to the regional lymph nodes occurs. Metastasis is to the inguinal nodes if the lesion lies in the lower third of the vagina; to the middle chain of the external iliac group of lymph nodes, to the hypogastric group, and to the nodes which lie over the promontory of the sacrum if the primary growth lies in the superior two-thirds of the vagina.

The initial symptoms of the disease are insidious in the majority of cases. A slight intermenstrual discharge, usually but not always bloody, or the accidental finding of the growth, may be the only sign until the lesion has become advanced. In Case 37, as reported in this paper, the early symptoms were entirely lacking. The first symptom, pelvic pain, testified to the extension of the disease into the pelvic nodes, with pressure on the posterior root ganglia.

Broders, in 1922 presented, in his study of malignant conditions of the genito-urinary tract, a series of eighteen cases of vaginal carcinoma seen at The Mayo Clinic between 1904 and 1915. Stacy's report has been mentioned. Her 21 cases were seen between 1915 and 1921. She was able to get follow-up reports from fourteen of the 21 patients, and her paper included reports in abstract of these 14 cases. The present paper includes reports of 24 cases in all, 20 of which have been seen between the time of Stacy's report and February, 1930. The other four of the 24 cases (Cases 15, 16, 17 and 18) were included in Stacy's 21 cases, but she was unable to trace them and therefore her paper did not include reports of them. They have been traced since, and are included here, making a total of 41 cases.

Stacy's Case 1 was not included in the percentages given in this paper, because information concerning the patient has not been obtained subsequent to that contained in Stacy's report. However, further information concerning her Cases 2 to 7 inclusive has been obtained and, therefore, these cases are included in the percentages. Data concerning these Cases 2 to 7 are given in Table I. Neither tabular data nor case reports concerning Stacy's Cases 8 to 14 inclusive are given in this paper since the patients had died when Stacy wrote. However, in order that Stacy's reports of cases and mine may be continuous I have numbered my first report of a case as Case 15.

TABLE I. SUMMARY OF DATA CONCERNING STACY'S CASES 2 TO 7 INCLUSIVE, EMBRACING INFORMATION OBTAINED SINCE STACY PUBLISHED HER ARTICLE*

CASE	AGE, YEARS, WHEN FIRST SEEN	NATURE OF GROWTH	YEAR	TREATMENT RADIUM, MG. HR. IN EACH APPLICATION	LENGTH OF LIFE OF PATIENT			
					ROENTGEN THERAPY, COURSES	DEAD		STILL LIVING, YEARS
						AFTER FIRST SYMPTOM, MONTHS	AFTER TREATMENT, MONTHS	
2	80	Not reported	1918	2700, 1500	0			12
3	50	Not reported	1919	2750, 2100, 2961, 1728, 3452	5	35	31	
4	67	Too necrotic	1920	2993, 2286, 1400, 150, 560	5	33	30	
5	36	Epithelioma, graded 3	1920	14298 (abdomen) 3556 (vagina)	5	56	52	
6	69	Epithelioma, graded 4	1920 1923	2114 (vagina) Treatment elsewhere	1		60	
7	63	Squamous-cell epithelioma, graded 4	1920	1218, 1484, elsewhere at intervals of 3 mos. for 2 years	1			10

*All cases were early within the definition given in this paper.

Of the entire number of 59 cases seen in the clinic to date, consisting of the series reported by Broders, that reported by Stacy, and the cases seen since their reports, specimens for biopsy were obtained in 37. Of these, 35 were squamous-cell epitheliomas and 2, adenocarcinomas. Of the squamous-cell epitheliomas, 20 were of malignancy graded 4 according to Broders' classification; 12, graded 3; 2, graded 2, and 1 graded 1. Of the adenocarcinomas, 1 was graded 4, the other, 3. Adenocarcinoma in this situation, although unusual, may be interpreted as arising from the remnant of Gärtner's ducts or from an adenomyoma of the rectovaginal septum (Case 30). Broders, however, is of the opinion that adenocarcinoma may develop from the basal layer of the pavement epithelium. It is interesting to note also, that in Case 30 although the lesion was advanced when the patient was first seen, and the pathologic report was of adenocarcinoma, graded 3, clinically the growth appeared to be less malignant than the usual squamous-cell type of growth of the same extent. As far as could be determined, the patient was entirely free from evidence of the disease, four years and eight months after her first symptom. The second patient with adenocarcinoma (Case 17) in which the growth was graded 4, however, died within six months of the first treatment.

The 41 cases are considered together on the one hand, and Broders' series of 18, on the other. In Broders' series, treatment, if given, was entirely by surgical measures; radium was not in general use in the

clinic in 1915 or before. In Stacy's series and mine each patient was treated wholly or in part by radium and roentgen rays.

In the series of 41 patients seen in the clinic after 1915 36 were married, and 5 were not married. Of the lesions in these 41 cases, 65 per cent were on the posterior surface of the vagina; 17.5 per cent were on the anterior surface; 10 per cent, on the first examination, were found to involve a large part of the vagina, and the remaining 7.5 per cent were on the lateral walls. The tendency of the growth to appear in the posterior part of the vagina has been widely noted by other observers. Ninety-two per cent of the women who had growths on the posterior wall of the vagina were married; 8 per cent were single. Of growths of the anterior wall, 47 per cent were in married women and 43 per cent in single women; the other 10 per cent were too extensive for the site of origin to be determined. In no case was there a history of a pessary having been used, nor was prolapse noted in any examination. Children had been born to 83 per cent of the married women in the series of 41. Fecundity as an accompaniment to vaginal neoplasm has been noted by several writers; the married women in this series had given birth to an average of three children each. An immediate family history of carcinoma was secured in 7 of the 41 cases.

In Case 31 there was evidence, from the duration and history of the disease, that the growth began as a benign lesion and that an irritating chemical, used to allay itching, may have inaugurated the malignant change. A similar case was reported by Engelkens in which a malignant growth of the vagina developed shortly after the introduction of pure compound solution of cresol (lysol).

A leucorrhœal discharge may in some instances act as an irritant, which, in conjunction with the unknown quantity which is designated as the patient's susceptibility to carcinoma, may produce the malignant lesion. It was present preceding the development of the growth in nine (43 per cent) of the 21 cases in the series of 41 in which the presence or absence of leucorrhœa was definitely noted.

The average age incidence in the series of 41 cases was forty-nine years. The youngest patient was aged twenty-eight years; five were aged thirty-five years or less.

Of the 41 patients with primary carcinoma of the vagina treated by any method at The Mayo Clinic between July, 1915, and January, 1930, information regarding the status of 37 had been obtained at the time this paper was written: seven had died by the time Stacy wrote; further information concerning Stacy's Cases 2 to 7 inclusive has been obtained since Stacy wrote; information concerning four more of Stacy's patients (Cases 15, 16, 17 and 18 of the present report) which she was unable to trace at the time she wrote has been obtained; and I am reporting in this paper 20 new cases. Nine (24.3 per cent) of

the 37 patients were living when this paper was written. Two of these (Cases 31 and 36) have experienced recurrence or failure of arrest of the growth. One of the two patients (Case 31) was operated upon, and operation was followed by radiotherapy; the second patient (Case 36) abandoned radiotherapy in favor of an unidentified treatment by injection. The 7 remaining living patients are without evidence of the disease; 3 have lived two years or more following treatment: 1, three years; 1, eight years; 1, ten years, and 1, twelve years. All of these 7 cases except 1 (Case 30) in which the diagnosis was adenocarcinoma, belonged to the group which I have designated as "early." By this I mean those in which, irrespective of the size of the local lesion, involvement of the regional lymph nodes was not noted in the first examination. This grouping is an arbitrary one, and obviously inaccurate, for it includes without doubt cases with undetected nodal involvement. The size, and some other characteristics, of the local lesions in these 7 living patients was as follows: Case 7, "one inch in circumference" (2.5 cm.); Case 19, modified by cautery, "vault of the vagina," measurements not given; Case 34, 4 cm. long by 2 cm. wide, papilloma; Case 20, 6 cm. long by 4 cm wide; Case 38, 3.5 cm., 4 cm., and 2.5 cm. in various diameters; Case 30, adenocarcinoma, "size of grapefruit"; Case 2, 3.5 cm. long by 2 cm. wide.

Among the patients who were treated by radium only, or by radium and roentgen rays only, the average length of life of these who died with early lesions, was two years, ten months and fifteen days, and of the patients with advanced lesions, two years and eight months. Of the patients in whose cases, all of which were early, both surgery and radium were used, the average length of life was one year; the one living patient of this group showed evidence of malignant activity within one year.

Broders' series of 18 cases, seen in the clinic between 1904 and 1915, were all either inoperable or treatment was by operation only. Of this series, two cases were discarded as being of unknown outcome; of the remaining 16, 4 were inoperable. Of the 12 patients who were operated upon, 2 (16.6 per cent) were surviving at nine years and five months, and at fourteen years and seven months, respectively, following treatment. In one of these 2 cases, the growth was a squamous-cell epithelioma, graded 4, 4 cm. long and 3 cm. wide; in the other, the lesion was a squamous-cell epithelioma, graded 3, 2.4 cm. in diameter, and the patient, thirty-eight years of age; in both cases, operation consisted of simple excision. The operations used in this series of twelve cases, all of which fell into the group designated early, were as follows: excision with knife, 4; operation with Percy cautery, 3; operation with actual cautery, 2; hysterectomy with removal of vagina and vulva, one; hysterectomy with removal of vagina, one; excision of entire posterior wall of vagina, entire anterior wall of rectum, and part of bladder, one, and excision with actual cautery of part of bladder, one. Of ten patients who died following treatment by operation only, the average length of life

was ten months and eighteen days. The average length of life in the 4 cases which were inoperable, and in which treatment was not given, was one year, one month and sixteen days.

It may be said, therefore, after referring to the two preceding paragraphs, that the palliative results of radiotherapy, compared with the results in cases in which no treatment is given, give an added average life following treatment of one year and nine months in the early group and of one year and seven months in the advanced group. Radiotherapy has resulted in arrest or cure in 6 of 12 early cases (50 per cent) as opposed to 2 of 12 cases (16.6 per cent) treated by operation only. Radiotherapy also has resulted in arrest or cure in one case of 21 advanced cases; this case would have been rejected for operation only, because of pelvic glandular involvement. By all methods of treatment, however, only 9 patients of 53 (37 of the combined series of 41 plus 16 of Broders' series) concerning whom the result was known when this paper was written have survived without evidence of recurrence for from two to twelve years, a percentage of so-called cure of only 17 per cent. This deplorably low figure indicates not only the high degree of malignancy of the lesions but the failure in large measure both of early diagnosis and of present methods of dealing with the disease.

REPORT OF CASES

CASE 15.—A woman, aged sixty-two years, registered at the clinic March 26, 1920. She had been married thirty-eight years and had had three children. The menopause had occurred twelve years before. Four months prior to her coming to the clinic sudden, profuse, vaginal hemorrhage had occurred. This was followed by daily bleeding until the time of admission. For a time before her admission at the clinic, she had been conscious of a sense of pelvic weight.

Examination revealed induration of the anterior vaginal wall from the vault to within 1 cm. of the introitus. From the clinical picture the diagnosis of advanced primary malignant growth of the vaginal wall was made. Radium, 1,512 mg. hr., in two vaginal applications, was given. The patient died in December, 1920, nine months after registration.

CASE 16.—A woman, aged fifty years, registered at the clinic November 4, 1925. This patient had been married twice and had had two children. Menstrual periods were normal and regular until three years before she came to the clinic, when flow became infrequent and scant. For the month before her admission, a blood-tinged leucorrheal discharge had been present.

Examination revealed an ulcerated crater on the right vaginal wall, very firm and indurated, with a nodule 0.5 cm. wide by 1 cm. long on the posterior surface of the vagina. At biopsy squamous-cell epithelioma, graded 4, was disclosed. Radium was given. The patient died a few months later, probably of apoplexy.

CASE 17.—A woman, aged fifty years, registered at the clinic March 20, 1917. She had had 11 children. Her periods of menstrual flow had occurred at intervals of three weeks and, for the year previous to her registration flow had been slightly more profuse than before. Two weeks previous to her registration she had discovered a growth protruding from the introitus.

Examination revealed a thick nodule, 3 to 4 cm. in diameter, in the posterior vaginal wall, with two warty, ulcerating areas overlying the growth. The fundus of the uterus contained fibromyomas. March 27, the nodes and fascia were resected from both inguinal regions and the growth was widely excised. The nodes were reported to be the site of inflammatory reaction and the growth, adenocarcinoma, graded 4. By means of three radium packs, 1,400 mg. hr. were administered in the vagina, and 750 mg. hr. on the abdomen. For one month the patient was free of symptoms; then bleeding from the vagina occurred, and the patient was conscious of a sense of fullness in the pelvis. Examination revealed pelvic and abdominal masses. There was no evidence of local recurrence. She was given two subsequent series of treatments by roentgen rays but died, apparently of abdominal metastasis, August 6, 1917, five months after the operation.

CASE 18.—A woman, aged forty-seven years, registered at the clinic August 18, 1919. She had been married twenty-six years and had had 5 children and one miscarriage. Five months preceding her admission menstrual flow had continued for thirty days. It had been intermittent since and of a peculiarly foul odor.

Examination at the clinic revealed a cystocele with three areas of ulceration. Just within the introitus, on the anterior vaginal wall, was a soft, spongy mass with a "dimpling" that admitted the finger to the first joint and which bled easily. The cervix pointed posteriorly, and was smooth. The uterus was movable and otherwise normal. Radium was placed in the growth, and 1,721 mg. hr. were given in three applications. The patient's death occurred in 1920, approximately one year from the onset of symptoms.

CASE 19.—A woman, aged thirty-three years, registered at the clinic May 7, 1928. She had been married eight years, but had not become pregnant. Her menstrual periods had always been normal. She had begun having vaginal bleeding three months prior to her admission. She had consulted a physician who had removed a specimen from a growth and had cauterized "something." The specimen had been reported elsewhere as being a portion of a squamous-cell epithelioma, and the patient had been given six treatments by roentgen rays before she came to the clinic.

Examination revealed an early lesion with evidence of recent use of a cautery, in the upper left fornix of the vagina, extending onto the right vaginal portion of the cervix. The cervical os was normal, and the fundus of the uterus, small, anterior, and movable. The adnexa were not infiltrated. A specimen removed from the vaginal wall was reported as being squamous-cell epithelioma, graded 3, and the patient was given 4,476 mg. hr. of radium by means of intrauterine applications and vaginal packs. Following this, she was given a course of treatment with roentgen rays. Three months later she returned for examination, at which time only scarring was found in the left wall of the vagina. There was slight induration in the broad ligament on the left side, and the patient was given a second course of roentgen therapy. Since this treatment, both the attending physician and the patient have reported that she is in good health. On examination, April 28, 1930, two years and three months after the original symptom, there was no evidence of recurrence.

CASE 20.—A woman, aged forty-six years, registered at the clinic January 30, 1922. This patient had been married eighteen years and had had two children. Her menstrual periods always had been normal and regular. She had been examined in the clinic in 1920, when a lacerated cystic cervix had been noted, but leucorrheal discharge had not been noted at that time. For five months preceding her present admission she had been having a semi-watery and pink-tinged discharge. There was no history of metrorrhagia. A week before she came to the clinic, her physician had given her two applications of radium, and following this the discharge had decreased in amount.

Examination revealed a growth, 6 and 4 cm. in different diameters, with raised margins, on the posterior vaginal wall. The cervix was not involved. By means of vaginal packs, and of application over the inguinal glands, 7,790 mg. hr. of radium were given; this was followed by a course of roentgen rays applied over the abdomen and back. The patient returned six weeks after treatment, at which time improvement was marked. The mass had practically disappeared and the epithelium was smooth. There was questionable enlargement of the right inguinal glands, as well as slight induration in the right broad ligament. The patient was given 4,000 mg. hr. of radium; application was into the vagina and over the glands. This was followed by roentgen therapy. The patient returned in two and eight months, respectively; each time, she received a course of roentgen therapy over the abdomen and back. There was no evidence of local recurrence at either examination. The patient wrote, in answer to a questionnaire in May, 1930, that she had been entirely free of symptoms since she was last examined, a period of eight years.

CASE 21.—An unmarried woman, aged sixty-seven years, registered April 6, 1928. The menopause had occurred twenty-seven years before the examination. For two years previous to her examination the patient had been having dysuria and frequency, and for four months before her examination she had been troubled with low backache, anorexia, and loss of weight.

Examination revealed a small introitus, with an extensive, hard mass on the anterior vaginal wall, causing urinary obstruction. Rectal examination revealed pelvic induration and fixation of the mass. Cystoscopic examination did not give evidence of any involvement of the urethra. The condition was advanced. Biopsy of the growth was reported as squamous-cell epithelioma, graded 4. Radium was placed in the vagina, and 1,998 mg. hr. were administered. A full course of roentgen therapy was given over the abdomen and back.

The patient was asked to return for further treatment within three months but failed to do so. She died October 17, 1928, which was about six months following treatment and, as near as could be determined, about two and a half years following the onset of her symptoms.

CASE 22.—An unmarried woman, aged forty-six years, registered March 17, 1921. The pelvic condition had been subjectively normal, and the menses had occurred at an interval of twenty-three days until about six months before the examination, when the patient had become troubled with a daily, bloody, vaginal discharge of a peculiarly foul odor. The patient also complained of a pain, which had developed about two months previous to her examination, low in the right pelvic and lumbosacral region. This pain was worse at night. There had been some recent loss of weight. The patient had consulted her local physician at the onset of her symptoms, but examination had not been made at that time.

Examination at the clinic revealed a mass on the right lateral and posterior walls of the vagina, about 6 cm. and 2 cm. in different diameters, trough-like in appearance with indurated margins. There was considerable infiltration in the right broad ligament, which, with the presence of root pain, made the prognosis seem very poor. The patient was given 4,900 mg. hr. of radium and roentgen therapy to the abdomen and back. In July only a firm ridge of tissue remained in the right side of the vault of the vagina. Rectal examination, however, revealed persisting induration in the right side of the pelvis. A second course of radium, consisting of 4,844 mg. hr., was applied in the vagina and to the inguinal glands. This was followed by a second series of treatments by roentgen rays.

The patient died two years and five months after her initial symptoms.

CASE 23.—A woman, aged forty-eight years, registered July 14, 1921. She had been married for twenty-one years and had had two children. Her menstrual periods were normal. She gave a history of indefinite pelvic pain during the seven months

preceding examination. There had been no unusual discharge. During this interval there had been three normal menstrual periods.

Examination revealed a granular, ulcerating mass, 6 cm. and 2 cm. in different diameters, on the posterior wall of the vagina. The cervix was not involved, but there was marked bilateral induration in the pelvis, with fixation of the uterus. A specimen for microscopic diagnosis was taken, and the report was squamous-cell epithelioma, graded 3. Radium, 2,240 mg. hr., was given in July, and 700 mg. hr. in August, with roentgen therapy to the abdomen and back. When the patient was seen in March, 1922, marked local response to treatment had occurred, although infiltration in the broad ligament was still present. A specimen from the vault of the vagina contained active carcinomatous cells, and 700 mg. hr. of radium were given, with a second course of roentgen therapy. Because of the hopeless nature of this case the patient was not urged to return for further treatment.

Death occurred September 21, 1924. It is impossible to estimate the duration of the disease in this case, for the growth was well advanced, and there was definite pelvic metastasis when the patient was first seen. The history gave no clue as to the time of onset. Death occurred three years and two months following treatment.

CASE 24.—A woman, aged thirty-nine years, registered October 17, 1921. She had been married for sixteen years, and had been delivered of one child at full term and had had four miscarriages. Until a month preceding her admission, menstrual periods had been normal, occurring at intervals of three weeks but the vagina had been insufficiently expansible for four months. There had been bleeding following sexual intercourse for six years but no dyspareunia until June. She was examined elsewhere and two radium packs were applied and exposure to roentgen rays was given in July and August.

Examination revealed partial occlusion of the vagina, 2.5 cm. from the introitus, the obstruction consisting of a firm cicatrix, granular at one point. The pelvic structures were also involved in induration. Radium, 700 mg. hr., and a course of treatment by roentgen rays over four pelvic portals were given. The patient was advised to have further treatment by roentgen rays but wished to take this nearer home. Eleven months later she returned with a history of loss in weight of 25 pounds and much weakness which had developed in the preceding three months. She had been relieved of pain and of discharge for seven months following the treatment but she had failed to continue the treatment elsewhere. She had recently been taking as much as 5 grains of morphine daily because of pain. Examination revealed complete closure of the vagina by the growth, with a fixed pelvic mass, and much involvement of the broad ligaments. The patient was given radium, 1,400 mg. hr., and a second course of roentgen rays. However, the course of the disease was rapidly downward, and she died January 5, 1923. The duration of the disease, from the first definite symptom, was one year and eight months.

CASE 25.—A woman, aged thirty-five years, registered June 17, 1921. She had been married for eighteen years and had had one child. Her history was of a normal condition, except for somewhat irregular menstrual periods, suggestive of ovarian dysfunction. Eight weeks previous to examination, menstruation did not cease at the usual time, and the bleeding had continued to the date of her admission.

Examination revealed a cauliflower-like growth on the posterior vaginal wall, extending well up both sides of the vagina, but not grossly involving the face of the cervix, which, although edematous, was smooth. The uterus was somewhat large but movable. Clinically the lesion was an epithelioma of the vagina but a specimen revealed that the cervix was involved secondarily. The pathologic report was squamous-cell epithelioma, graded 4. Radium, 4,900 mg. hr., was given in seven applications to the vagina and cervix. This was followed by a course of roentgen therapy administered over three portals. The patient died August 1, 1922, sixteen months after the first symptom of the disease had appeared.

CASE 26.—A woman, aged sixty-two years, registered August 3, 1923. She gave a history indicative of a normal pelvic condition. She had passed through six normal pregnancies which had ended in spontaneous deliveries. Menopause had occurred twenty-two years previous to examination. There had been no leucorrhea subsequent to menopause until two or three months before examination, when she first had noticed irregular staining with blood. Douches had been advised by her physician but the bloody discharge had continued.

Examination at the clinic revealed an ulcerating lesion, 5 cm. and 6 cm. in different diameters, with indurated margins on the posterior wall of the vagina, near the introitus. The inguinal glands were enlarged on both sides. The growth was clinically malignant. Radium, 13,524 mg. hr., was given, two packs in the vagina and twelve on the groin. Examination in eight weeks revealed evidence of about 70 per cent decrease in the size of the growth. Radium, 2,100 mg. hr., was given locally in three applications. Roentgen therapy was not given at either time. The patient died October 22, 1929, sixteen or seventeen months after the first symptom of the disease.

CASE 27.—A woman, aged forty-six years, registered June 23, 1927. This patient had been married for seven years without becoming pregnant. She had been troubled by a profuse leucorrhoeal discharge for about three years but her menstrual periods had been normal until about three months before when irregular vaginal bleeding began. This continued to the date of admission.

Examination revealed a tumor in the upper two-thirds of the vaginal wall, extending to the right lateral pelvic wall. The right half of the cervix was secondarily involved. The pathologic report was of squamous-cell epithelioma, graded 4. There was marked infiltration of the broad ligament, and involvement also of the inguinal glands. Although the prognosis was unfavorable, the patient was referred for treatment by radium and roentgen rays. Radium, 4,116 mg. hr., was given in light applications in the vagina, and within the uterus. Radium was also given by needles placed in the growth. This was followed by a course of high-voltage roentgen therapy over four pelvic portals. Examination three months later revealed the right fornix and right lateral walls to be scarred, contracted, and finely nodular. Rectal examination revealed some thickening of the region of the right broad ligament. The inguinal glands seemed inactive. A second course of roentgen therapy was given. The patient returned in January, 1928, at which time there was marked infiltration and fixation of all the pelvic structures. Although a third course of roentgen therapy was given, the patient died eight months later, in August, 1928.

CASE 28.—A woman, aged sixty-eight years, registered March 27, 1922. In August, 1920, the patient had experienced a sudden gush of blood from the vagina, for which she consulted a physician. She was told of the presence of a vaginal growth. Five applications of radium were given. In March, 1921, bleeding recurred and the patient was given three more applications of radium, amount unknown. In December, 1921, a thin, watery, foul-smelling discharge again developed. A feeling of pelvic distress had been present for some time, but actual pain was not felt.

Examination at the clinic revealed that the vagina was filled with a fungating mass, but that the cervix was fairly free. There was definite thickening in the right broad ligament. Radium, 1,100 mg. hr., was given in the vagina, followed by a course of roentgen therapy applied to the abdomen and back. The patient died January 4, 1923, two years and five months from the date of the initial symptoms.

CASE 29.—A woman, aged forty-four years, registered January 12, 1929. The history contained nothing abnormal. The patient had had two children. For several years preceding the present symptoms she had been annoyed by a leucorrhoeal dis-

charge. A year previous to admission, while she was doing her housework, she had a severe vaginal hemorrhage, following which a thin, watery, foul-smelling discharge developed, which was sufficient to require her to wear a pad constantly. Menstrual periods were regular but flow was more profuse than it should be and the patient had had a sense of bearing down in the year preceding registration.

Examination revealed a massive tumor, infiltrating nearly all of the posterior vaginal wall. A small, flat cervix could be felt. Although the rectovaginal septum was deeply involved, the rectal mucous membrane was intact. The fundus seemed normal, but there was a firm, irregular mass anterior and fixed to the uterus. Biopsy was taken and the report was squamous-cell epithelioma, graded 4. The patient was given a full course of irradiation, 8,446 mg. hr. in nine applications. The radium was placed within the growth and on the groin, and a full course of high-voltage roentgen therapy was given. The patient died three months later. The duration of the disease, from the initial symptom (hemorrhage), was about fifteen months.

CASE 30.—A woman, aged fifty-five years, registered February 2, 1928. Her history, relative to the pelvis, was normal, and she had had one child. Menstrual periods had ceased at the age of fifty years, and discharge was not seen until three years later, when slight, intermittent, vaginal bleeding occurred. After bleeding had persisted for about a year she had consulted a physician, who told her that she had several pelvic tumors and a small vaginal growth. Abdominal exploration was done and an operation, consisting of myomectomy for fibromyomas and oöphorectomy for a multilocular ovarian cyst, was performed in June, 1927. The patient was told to return within three months for attention to the vaginal growth. This, however, she failed to do until the continued vaginal bleeding finally induced her to return. On examination she was told that a more serious type of growth had developed, and she was referred to the clinic.

The cervix was atrophic, the fundus was small, placed anteriorly, and movable, and there was a large, bleeding, proliferating, fungating growth about 10 cm. in diameter, originating from the posterior vaginal wall, filling the vagina, and impinging on the rectal lumen. The rectal mucous membrane was not involved. Pathologic report of a specimen was of adenocarcinoma, graded 3. Radium, 1,974 mg. hr., was given in three applications, in eleven days. The radium was placed within the tumor. At the end of this time the tumor had shrunk to 95 per cent of the original size. The treatment was continued until 4,074 mg. hr. had been given in the vagina. This was followed by a course of roentgen therapy and the patient was advised to return in three months. She returned in April with a history of increasing obstruction, and examination revealed adherent mucosa in the posterior vaginal vault, attached to a mass in the culdesac. The rectum was so reduced in size that colostomy was resorted to. The patient was seen in August, and again in October, at which time she received a second course of roentgen therapy. The following April examination revealed much reduction in the pelvic infiltration and a third course of roentgen therapy was administered. In July, the vaginal mucosa was observed to be smooth, there was slight thickening of the posterior fourchette, and the carcinoma of the pelvis seemed under control. The patient replied in answer to a questionnaire, April 16, 1930, that she had no pelvic symptoms and had gained in weight. In January, 1931, examination at the clinic did not reveal any evidence of malignant activity. This was three years after treatment and more than four years after the development of the first symptom.

Comment.—This is one of two cases of vaginal adenocarcinoma in the series and the origin of the growth is obscure. Ovarian origin is possible, although the ovarian condition was that of multilocular cyst. Since the vaginal growth was present at the time of operation, it

seems very probable that any intrapelvic condition advanced enough to cause vaginal metastasis would have been detected at operation. It seems more likely that the lesion was an independent malignant condition, originating from a remnant of the wolffian duct or possibly from an adenomyoma of the rectal vaginal septum.

CASE 31.—A woman, aged forty-eight years, registered at the clinic October 2, 1928. She had had two children. In 1914 she had been operated upon for "tumors" and both ovaries and appendix had been removed. She had been divorced for several years. The patient stated that in May, 1927, an itching sensation drew her attention to a small nodule in the vagina, about 1 cm. in diameter, and she applied iodine, 7 per cent, repeatedly to stop the itching. The tumor had grown rapidly in the two months previous to registration. Examination revealed a cauliflower-like growth involving the lower third of the vagina. The uterus and cervix seemed normal. Biopsy revealed squamous-cell epithelioma, graded 1, and wide excision of the growth was done. Following this, 1,892 mg. hr. of radium were applied in three doses. The radium was placed in the growth, and high-voltage roentgen therapy was applied over four fields. A second course of roentgen therapy was advised to be given in three months, this to be arranged for by the physician at home; the patient was not in a position to return to the clinic. The course of treatment that was advised was not carried out, however. In December, 1930, the patient wrote that there had been local recurrence of the growth and that it filled the vagina.

CASE 32.—A woman, aged forty-seven years, registered June 30, 1927. Her menstrual history was normal. She had been married sixteen years without a pregnancy. The patient had noticed vaginal bleeding two weeks previously, following intercourse.

Examination revealed a fungating, bleeding, vaginal growth on the posterior vaginal wall, near the introitus. Operation was performed July 8, 1927, and the posterior vaginal wall and anterior part of the rectum were resected. Pathologic report was of squamous-cell epithelioma, graded 2. Radium, 1,000 mg. hr., was given by means of a vaginal pack. The patient returned in two months, at which time nodular infiltration in the posterior vaginal wall was apparent, and radium, 1,900 mg. hr., followed by application of roentgen rays to the abdomen and back, was given. This recurrent growth rapidly extended in the next three months. In January, 1928, a large, hard, nodular, fixed tumor was present in the posterior and left portions of the vaginal wall, and a rectovaginal fistula was present. Radium was placed in the growth, and 1,900 mg. hr. were given in October, 2,712 in January, and 2,100 in April. Apparently these measures did not retard the growth, which within the next three months filled the vagina and invaded the broad ligaments and lymph nodes. The patient died in 1929 within two years of the onset of the disease.

CASE 33.—A woman, aged forty-five years, registered June 2, 1922. The history in general and the pelvic history, were negative except that in the year preceding registration she had occasionally missed a period of menstrual flow. One month previous to admission there had been a slight, watery discharge from the vagina, with an offensive odor. The discharge had become sufficiently profuse to require the patient to wear a pad. Her general health was good.

Examination revealed an irregular mass, about 3 to 5 cm. in length, covering a region approximately 4 cm. and 5 cm. in different diameters attached to the left wall of the vagina. The cervix and fundus seemed normal. After surgical consultation, dilatation and curettage, and excision of the growth by cautery, were advised. This was done June 5, 1922. Uterine scrapings gave no evidence of malignancy. The growth was then removed by cautery and the report was of squamous-cell

epithelioma, graded 3. This procedure was followed by application of 2,730 mg. hr. of radium in four treatments, as vaginal packs, and high-voltage roentgen therapy was given over 6 pelvic portals. A month later there was still induration about the introitus, and some rigidity of the vaginal wall. A second course of roentgen therapy was given. In another month a profuse watery discharge had developed. Definite infiltration of the operative site was apparent and the patient complained of intense nocturnal pain in the right hip. More radium, 2,100 mg. hr., was given in three applications to the vagina. In November, a deep ulcer was present, which was attached to the ilcum, and the inguinal nodes on both sides were thickened. There was also involvement of the deep pelvic lymph nodes, and the pain in the hip and back had increased. More roentgen therapy was given but the case was hopeless and death occurred January 8, 1923. Necropsy revealed extensive metastasis to the retroperitoneal lymph nodes. There were no carcinoma cells in the vaginal ulcer. The course of the disease from the first symptom was eight months.

CASE 34.—A woman, aged sixty years, registered May 1, 1928. She had passed the menopause fifteen years previously. She had been married for a short time earlier in life, but there had been no pregnancies. Menstrual periods had always been normal. For a year previous to admission there had been a daily, bloody vaginal discharge, and she had herself discovered a vaginal growth several months before. She had been given two treatments with roentgen rays elsewhere.

Examination revealed atrophic atresia of the upper portion of the vagina, which sealed off the cervix. The cervix was neither visible nor palpable. In the posterior upper portion of this lower culdesae of the vagina was found a papillary growth, 1 cm. in length, with a broad, plaque-like base. To rectal examination the cervix and uterus seemed normal, and there was no pelvic induration. Biopsy revealed squamous-cell epithelioma, graded 4, and radium, 1,180 mg. hr., was given in two applications, by means of needling about the base of the growth and as a vaginal pack. A course of high-voltage roentgen therapy was also given over four fields. The patient was advised to report to her physician at home in three months, to consider the necessity of further treatment to be given nearer her home. She neglected to do this, however. In answer to a questionnaire, in May, 1930, she stated that she was free of symptoms, three or four years after the original symptoms.

Comment.—In spite of bleeding for one year and the finding of the growth by the patient nearly two years preceding treatment, the lesion at the time of examination was small and apparently early. It seems probable that the growth started as a benign papilloma, and underwent malignant change possibly only shortly before treatment was instituted.

CASE 35.—A woman, aged forty-four years, had been married ten years without a pregnancy. Periods of menstrual flow had occurred at intervals of four weeks until three years before, when the interval of time between periods had shortened. This she attributed to the high altitude into which she had moved. Five months before she came to the clinic, an unusual leucorrhoeal discharge made its appearance. A month later backache began, which increased in intensity, and finally induced her to consult a physician, October 15, 1929. A growth was found, and material for biopsy was taken which was reported as squamous-cell carcinoma.

Examination at the clinic revealed a firm, immovable mass, about 2.5 cm. in diameter, in the region of the culdesac with central ulceration on the posterior wall of the vagina, involving the cervix secondarily. There was some fixation of the

fundus, with a transverse area of pelvic induration in the region of the vaginal growth. Biopsy revealed squamous-cell epithelioma, graded 4. Radium, 2,960 mg. hr., was given in 6 vaginal applications. This was followed by high-voltage roentgen therapy over four fields. The patient returned three months later. Examination revealed that the vaginal lesion was smaller, but that the fixed pelvic induration remained unchanged. The patient was suffering from considerable pelvic pain. Radium, 1,200 mg. hr., was given in two vaginal applications, followed by a second course of roentgen therapy. She was asked to return in three months, but instead she took an unidentified treatment by injection. Her physician at home has reported that she returned with the condition unchanged, that the growth ulcerated through the bladder and rectum, and that she was kept under the influence of morphine until her death, which occurred about the first of September, 1930, fifteen months after the original symptom.

CASE 36.—A woman, aged fifty-five years, registered January 2, 1930. She had been divorced for ten years. In early life she had had several induced abortions. In 1908 she had been a patient at the clinic at which time she was operated upon, both tubes and one ovary being removed because of infection with tubo-ovarian abscess. Her menstrual periods had ceased at the age of forty-five years but had been normal before that. In March, 1929, because of difficult micturition, the patient consulted a physician at home who had excised a specimen from a "ridge in the vagina." This was reported as being benign. The patient was given three treatments with radium, however. The following November she noticed enlargement of the inguinal nodes, and increasing pain and difficulty in micturition brought her to the clinic.

Examination disclosed an area of induration and ulceration, 3 or 4 cm. in diameter, on the anterior wall of the vagina. The inguinal glands were enlarged, and cystoscopic examination revealed secondary involvement of the urethral wall. A specimen was reported as being squamous-cell epithelioma, graded 4. Radium, 8,610 mg. hr., was applied to the lesion and inguinal regions and this was followed by high-voltage roentgen therapy applied at four portals. The patient was advised to return in three months but instead adopted an unidentified treatment by injection. The patient answered the questionnaire sent her in April, stating that pain in the legs had been somewhat relieved. She wrote a letter in November, however, expressing her regret in having abandoned radiotherapy, but did not give details of her condition.

CASE 37.—A woman, aged seventy-five years, registered April 30, 1925. She had been married for fifty-seven years, and had had eight children. Her last period of menstrual flow had occurred in 1900. For six months prior to her examination the patient had suffered constantly with a dull, heavy discomfort in the lower part of the abdomen. At times, severe cramping pain occurred. There had been no vaginal bleeding or discharge.

Examination revealed a rough, infiltrated region on the mesial posterior third of the vaginal wall, with a large pelvic mass in the region of the left broad ligament. A specimen from the growth, for biopsy, revealed squamous-cell epithelioma, graded 4. Although treatment could be only palliative she was given radium, 700 mg. hr., in the vagina to prevent vaginal extension.

The patient died April 5, 1926. The duration of the disease from the first symptom, which occurred late in the course of the disease, was approximately eighteen months.

Comment.—The relatively small size of the primary growth, with early and extensive pelvic metastasis, no doubt accounts for the lack of vaginal signs and for the fact that the first symptoms were those of deep pelvic and abdominal metastasis.

CASE 38.—A woman, aged sixty-five years, registered August 9, 1927. She had been married forty-three years, and had had three children and one miscarriage. The menopause had occurred twenty years before registration. The patient had noticed spotting with blood from the vagina for a year.

Examination revealed the presence of a purulent, bloody discharge, without odor. Also, there was a hard, irregular growth on the posterior vaginal wall, just within the introitus, 3.5 and 4 cm. in different diameters extending to within 1.5 cm. of the cervix, and laterally for about half the circumference of the vagina. The inguinal nodes were not palpable, but some infiltration in the pelvis was discovered. Biopsy disclosed squamous-cell epithelioma, graded 4. Radium, 10,500 mg. hr., was given, 7,600 over the groins and the remainder by placing the radium in the growth. This was followed by a course of roentgen therapy applied over the abdomen and back. Two months later the growth had disappeared, and a puckered region only remained, with injection of the vaginal wall. There was no deep induration. A second course of roentgen therapy was given. The patient has reported by letter at intervals, and has remained well. The last examination, in August, 1930, made by her physician at home did not reveal any evidence of recurrence, four years after the initial symptom.

REFERENCES

- (1) *Bailey, Harold and Bagg, H. J.*: AM. J. OBST. & GYN. 2: 587, 1921.
 (2) *Broders, A. C.*: Ann. Surg. 75: 574, 1922. (3) *Engelkens, J. H.*: Nederl. Tijdschr. v. Geneesk. 1: 27, 1922. (4) *Ritchie, R. N.*: AM. J. OBST. & GYN. 18: 794, 1929. (5) *Tuft, Louis*: Arch. Path. 9: 654, 1930.

THE RELATIONSHIP BETWEEN MOTHER'S GAIN DURING PREGNANCY AND INFANT'S BIRTH WEIGHT

BY PERCY W. TOOMBS, M.D., MEMPHIS, TENN.

THE ancient Latin word for *midwife*, *obstetrix*, is usually rendered literally in modern English as "she who stands before her patient." But on reflection it appears that the verb *obsto* means not only to "stand before" but likewise to "stand against." Might it not be as literal a rendering to say that the midwife was one who "stood against" the forces which act to hinder and prevent the birth of the fetus? Looking back over a considerable period devoted to the practice of obstetrics, I am inclined to believe that the second idea lies behind the formation of this word, rather than the first. Far more often does the obstetrician find it necessary to actively oppose injurious conditions than merely to stand by and watch normal ones evolve for the ultimate good of all concerned.

This active opposition on the part of the physician who makes a specialty of "baby cases" begins long before the new citizen enters his earliest environment. The emphasis laid during recent years upon prenatal care has tended to advance this activity even further. More and more he is urged to "stand by" his patient from the very outset of pregnancy, and more and more is he called upon to oppose those

influences, moral, physical, and spiritual, which are likely to work ill to mother and unborn child. Especial stress has been laid upon one phase of this activity at one period; then interest has suddenly swerved to something else, only to be again diverted into still a third channel, and so on. Yet through the rise and fall of enthusiasms, and the inception and rejection of fads, certain ideas have held their own, and certain ends, universally held to be desirable of attainment, have never been wholly lost to view.

Thus it has always been recognized that disproportion of the fetal parts to the dimensions of the mother's pelvic outlet was one of the greatest obstacles to normal delivery. The effort to overcome the difficulties which arise in connection with this condition has steadily continued since the days before the flood, and the question is still quite unsettled despite centuries of earnest discussion. A few years ago we heard a great deal about the effect of the mother's diet upon the size of the fetus and it was confidently asserted in many quarters that by reducing the food intake of pregnant women with narrow pelvic outlets, they would have smaller babies who could readily enter the world *per via naturalis* where larger infants could hope for nothing better than high forceps or cesarean section.

I have given considerable attention to this phase of the age-long obstetric controversy. I studied faithfully the protocols of untold numbers of matron rats who laid down their lives for the benefit of human mothers; I weighed the arguments for and against restriction of proteins; I counted calories and compared the relative merits of different carbohydrates; I compiled weight charts. In short, I went carefully over every bit of evidence for and against the hypothesis that a baby's birth weight is in direct relation to his mother's gain or loss during the gestation period. And I finally concluded that there is nothing in it. I might elaborate this conclusion at considerable length and cite many authorities, but I prefer to give my personal experience and impressions rather than an extensive digest of literature. I do this the more willingly because in the main the literature does not come to the same conclusions that I do. I cannot help feeling that the experimenter shut up in his laboratory surrounded by his cages of white rats who starve or gourmandize at his whim and command, is not face to face with the same problems as the man who must assure an easy confinement to Mrs. Smith in her eleven-room-and-four-bath apartment, and not neglect Mrs. Jones who must scrub tenement-house stairs until it is time for her to go to the free maternity ward. Results which seem overwhelmingly convincing when witnessed in laboratory mice, often have a way of turning out quite differently in the regular routine of obstetric practice.

I do not wish to be understood as saying that it makes no difference what a woman eats during the nine months of pregnancy. On

the contrary her diet is of the utmost importance and its regulation one of the chief features of intelligent prenatal care. My contention is that the weight of the fetus is not influenced by such regulation, that the size of the child at the time of delivery is determined by factors quite distinct from this consideration, and in most instances, entirely beyond our control. Without going into an elaborate discussion of the inheritance of parental traits, we may very well turn to the experience of animal breeders, for example, those who raise mules. The diet of the equine mother differs considerably in various parts of the country, but the custom of breeding jacks to mares rather than stallions to jennets is universal, the stallion's colt is invariably too large for the jennet to bring into the world alive.

If a small woman married a large man, whose female relations are broad hipped and wide shouldered, her babies may "take after her folks" and be sufficiently diminutive to pass readily through the confines of her narrow pelvis. And again they may not. According to Mendel's law, in crossing dissimilar parental characteristics those from one parent tend to become active or dominant, while those from the other parent tend to become inactive or recessive. Thus the first generation resulting from the crossing of one parent's dominant characteristic with the other parent's recessive characteristic is a hybrid bearing the dominant characteristic, while the second generation, the result of crossing dominants with recessives of the preceding generation, manifests an average of three dominants to one recessive. As the average American family now contains only two and a fifth children, it is a trifle difficult to calculate just how great is the chance that our small women may bear children of a size suitable to make an easy job for the obstetrician. Possibly the one-fifth of a child might fulfil the requirements, but reducing the matter to figures seems always to present difficulties in actual everyday practice. As I said before, it is much easier when one is dealing with laboratory rats, who have never encountered any propaganda for birth control.

The matter of regulating the pregnant woman's diet so as to insure a relatively easy labor, with normal good health during the gestation period is no less important because one fails to perceive any direct connection between the weights of mother and offspring. It has been my observation, to which confirmatory evidence has frequently been offered both by literature and communication with other obstetricians, that under comfortable conditions of living the average woman tends to grow fat during pregnancy. The steady rise in the American standard of living is probably responsible for the increasing number of obese young married women. Noel Paton, who made his observations a quarter century ago in the slums of Edinburgh, came to the conclusion that the size of the offspring depended very directly upon the diet and nutrition of the mother during pregnancy, and the

guinea pigs in his laboratory backed up his contention. He concluded his report by saying: "To the physiologist the chief point of interest seems to be the demonstration of the limitations in the extent to which the tissues of the mother can be utilized for the construction of the embryo. The nourishment of the maternal tissues seems to take precedence over the nutrition of the fetus. Were this not the case, had the embryo the prior claim to nourishment, we should find that in badly nourished mothers, each gram would produce a greater proportionate weight of young than in well-nourished mothers. This is exactly the reverse of what occurs. The mother thus appears to pass on the *surplus* nourishment to the fetus, and the better the nourishment of the maternal tissues the greater is the growth of the young in utero."

If Paton's conclusions are correct, the theory of reduction of infant weight would depend on our being able to gauge exactly the nutritional requirements of the mother and restrict her intake to these alone. But here again my personal experience is at variance with those who have committed theirs to the printed page. My personal preference has been not to limit the diet during pregnancy but rather to attempt to restrict the intake when there appears to be excessive appetite. All observers agree that the woman should continue to eat the foods which she likes and to which she has been accustomed, providing, of course, that no complications arise. If the kidneys show signs of failure, or any other conditions appear which require special dietetic treatment, these must be handled in the same way that similar manifestations in the nonpregnant would be. There can be no hard and fast rule. Each patient must be regarded as an individual, not as a "case."

Exercise is very important, and walking at a moderate pace is by far the best form that it can take. The altruistic ideal of Henry Ford, to put the automobile within the reach of every man who was able to earn a living, has done not a little to increase the number of fat pregnant women, and make it still more difficult to usher the next generation into the world without undue hazard. The majority of the babies in my own practice who were conspicuously above normal weight at birth were the children of mothers who had taken comparatively little exercise. These large children are often post-mature, though just what relation exists between the size of the child and the length of time it takes to attain maturity I am not prepared to say. Although my obstetric experience has been rather extended, I still feel that my observation is not wide enough to permit me either to affirm or deny most of the contentions which previous writers have put forward. Indeed, that would be my criticism of practically everything which has been written. Generalizations have been made from too few instances. The laboratory workers slaughtered hundreds of

white mice before they announced their conclusions. But those who dealt with human material were content to be convinced by relatively small series of cases. Surely the mouse mothers and the human mothers should be placed on a parity at least!

In an endeavor to reduce my personal experience to figures, I have taken 250 cases from my private practice and divided them into four groups, according to the gain in weight which the mother made during pregnancy, and the weight of the child at birth. The normal gain in weight during pregnancy is estimated by C. H. Davis from a study of his own patients, as from 15 to 20 pounds. This agrees closely with the usually accepted figures. Seven pounds is the accepted average weight of the infant at the time of delivery. Taking these figures for a basis, my series was arranged as follows:

Group 1.	Mother gained 20 pounds or over Baby weighed 7 pounds or over	74 or 29.6 per cent
Group 2.	Mother gained 20 pounds or over Baby's weight under 7 pounds	31 or 12.4 per cent
Group 3.	Mother gained less than 20 pounds Baby's weight above 7 pounds	98 or 39.2 per cent
Group 4.	Mother gained less than 20 pounds Baby weighed less than 7 pounds	47 or 18.8 per cent

Mature consideration of these figures upset all the preconceived theories gathered from reading and study of the statistics and experiences of others. It will be noted that Group 3 is by all odds the largest of the four. Here the mother gained but little, yet gave birth to a child well over the average in size. In some cases the mother's gain was hardly enough to offset the actual weight of the child and the fetal membranes with their fluid content. Did these babies thrive at the expense of their mothers or not? As it has been impossible for me, for the purpose of this short paper, to arrange a personal contact with each of these 250 women, I cannot offhand recall whether all these listed in Group 3 were small-framed or not. The impression remains that they were of average size, certainly not conspicuously diminutive. But as some of these babies were of large size, we will probably have to examine the male parent, or even go further and study the females of his family, before we can decide whether or not the mother's weight, or lack of it, had any influence upon the size of the offspring.

Many of the mothers in Group 1, the second largest group, gained heavily during pregnancy, usually despite dietary limitation and frequent exhortations to exercise regularly. They were mostly women in what is known as "easy circumstances," and it is by no means easy to make members of this class restrict their food intake, or forsake the comfortable cushions of a limousine for a tramp along a rough and uneven road. The babies' weight ran rather high in this class, so my observation would be that the mother who increases greatly in weight is more likely than not to have a large baby, inas-

much as Group 2, the group where the mothers gained but the babies were below normal weight, contains less than half the number included in Group 1. Some of the Group 2 babies were very small indeed, and the reduction in the mother's postpartum weight as compared with that ascertained immediately before delivery was so slight that it showed that the fetus and the other products of conception accounted for only a small part of the total gain. These are the women upon whom maternity has a fattening effect. Investigators have tried to account for this in various ways. It has been attributed to the effect of pregnancy upon the thyroid, to inactivity of the ovarian hormone, to varicosity of the veins which, by making walking difficult, encourages to inactivity. All these explanations are reasonable and may apply in some cases. But I have yet to formulate or find as formulated by some one else, any theory which will fit every case. Every middle-aged man has had the saddening experience of meeting, after an interval of many years, some "slip of a girl" he had known in adolescence, only to find her as broad as she was long, and quite indifferent to her own lost grace of proportion because of her pride in her well-set-up sons and daughters. These women just seem to "get that way," often despite their own conscientious efforts to follow their physician's instructions as regards diet, exercise and so on. When there is conspicuous underweight for which no definite cause can be ascertained, the physician has ordinarily far less difficulty in having his prescribed régime carried out, often there is far less necessity for prescribing such a régime.

As I have said several times, I have not been able to arrive at any conclusions. Limitation of food intake, either voluntary under medical supervision, or involuntary, as under war conditions or other reasons for semistarvation, certainly does seem to have some effect in reducing the size of the children born of mothers occupying such an environment during pregnancy. At least this is the very definite impression I have gained from examination of the literature. But from my own personal experience I cannot state definitely that there is any effect, one way or the other,—the instances I have observed may have resulted from causes quite other than that to which I have attributed them. And I suspect that such may be the case with others whose state of mind is more positive than my own.

REFERENCES

- Barry, Lee Willis: *Contrib. Embryol.* 11: 91, 1920. Bonhote, J. Lewis: *Vigour and Heredity*, London, West, 1915, Newman & Co. Chapin, Henry Dwight: *Heredity and Child Culture*, ed. 2, New York, 1928, E. P. Dutton & Co. Davis, G. H.: *AM. J. OBST. & GYNEC.* 6: 575, 1923. Macomber, Donald: *The Effect of Diet Upon Reproduction*, *J. Am. Dietet. A.* 111: 57, 1927. Olow, John: *Acta Gynec. Scandinav.* 11: 59, 1924. Paton, D. Noel: *Lancet* 11: 21, 1903. Royston, G. D.: *J. Am. Dietet. A.* 111: 223, 1928. Sansum, W. D.: *California & West. Med.* 28: 1, 1928. Slemons, J. Morris: *Am. J. Obst.* 80: 194, 1919. Smith, G. F. Darwell: *Lancet* 11: 54, 1916.

ANALYSIS OF 100 CASES OF RUPTURED ECTOPIC GESTATION: TECHNIC AND EVALUATION OF AUTOHEMOFUSION

BY JAMES V. RICCI, M.D., AND SALVATORE DI PALMA, M.D.,
NEW YORK, N. Y.

IN THE diagnosis of ectopic gestation, accuracy does not prevail. Both the symptomatic manifestations and the usual laboratory evidence are so varied and oftentimes so noncommittal that even the admitted incidence of error is of no mean proportion. Indeed the diagnostic failures are further accentuated by the not uncommon occurrence of error in such instances which present the so-called classical or textbook portrayals of ectopic pregnancy. In support of this view is the eloquent assertion by Schumann¹ who states in his monograph on extrauterine gestation, "... even in the hands of expert gynecologists, the diagnosis of unruptured extrauterine pregnancy is more noteworthy by the high percentage of error than by the frequency with which correct conclusions are attained."

The difficulties of differentiation, however, are reduced to a minimum in the presence of a rupture with profuse intraabdominal bleeding for, with the occurrence of this added pathology, both the signs and symptoms are so pronounced and outstanding that the patient is dramatically self-diagnosed. With a view toward a more judicious appreciation of the symptomatic manifestations of this entity, we have deemed it advantageous to pass in review the usual laboratory and clinical evidence upon which a logically evolved differential diagnosis (in contradistinction to a snap intuitive one) ultimately depends.

It must not be left unsaid that the present statistical survey is based on the notations made by over thirty different interns (and *how* different, judging from the nature of the work), on the notations recorded by even a greater number of nurses, on the observations of twelve different surgeons and several pathologists. Taking into consideration the divergencies in concepts, the divergencies in appreciation and interpretation of the clinical and laboratory evidence, one can readily understand that the present conclusions may not, in all instances, reflect the truth. This apprehension becomes the more apparent when it is realized that all too often the charted histories of novice interns have differed so widely and so vividly from those taken by the author on the same patients. Oftentimes, gynecologists, cognizant of these discrepancies of the intern staff, remain totally indifferent to and even oblivious of the written histories; rather, they proceed to acquire their historical data individually from the patient,

prior to the examination. And yet, upon these written records of admitted questionable worth, at some future date, elaborate statistical fabrics are evolved.

Diagnostic Error.—The present analysis, based on the records of the Harlem Hospital in New York, includes a survey of 100 cases of ruptured ectopic tubes with profuse or moderately profuse intra-abdominal bleeding. There occurred in this series 11 mistakes in diagnosis divided as follows: 3 cases of miscarriage with secondary anemia; 2 cases of acute pelvic peritonitis; 1 ruptured pus tube; and 4 cases of acute salpingitis. Albeit in 4 instances of these 11, the diagnosticians wavered between the erroneous diagnosis and a possible ectopic. On the whole, the mistakes occurred in patients who presented a history of two missed periods, and in others whose pain, though sudden in onset and even severe, was not attended by syncope or a fainting spell, whereas in one of the two so-labelled cases of acute pelvic peritonitis, the examiner was unduly influenced by an admission on the part of the patient of an induced abortion.

Types of Menstrual Disorders (Table I).—Broadly speaking, in all of the 100 cases under consideration, menstrual irregularities of one type or other invariably occurred. True, the majority of instances, fully one-half, to be exact, presented the recognized missed period with a subsequent metrorrhagia. But, singularly enough, in 28 cases, the one-month amenorrhea was absent; while, in the other extreme, 11 cases presented a history of two missed periods. The irregularity most common to the largest number of cases was the presence of metrorrhagia.

TABLE I. TYPES OF MENSTRUAL DISORDERS

Missed period. With metrorrhagia	52 cases
Missed two periods. With metrorrhagia	11 cases
Missed period. With metrorrhagia	4 cases
No missed period. Metrorrhagia	28 cases

Pain Element (Table II).—The prevailing concept is that a tubal rupture is heralded by a sudden sharp agonizing pain in the lower quadrants accompanied by nausea and vomiting, and terminates with a fainting spell. In the present series, such an assumption does not hold, since in 16 of the cases, the nature of the pain present was in no manner comparable to the sudden lancinating type which ends in syncope. In general, though pain is a relative term, and the descriptions noted in the charts varied considerably, the impression formed may be summed up as follows: In 32 cases, the pain was sudden, severe, and the patient collapsed; in a similar number of cases, the characteristic syncope did not occur. In these 65 cases, the sudden attack of pain occurred without any premonitory rumblings, at least none were recorded. In 16 cases, the sudden sharp attack terminated

a previous two or three weeks of intermittent colicky pains. The remaining 19 cases were characterized by the presence of colicky pains and were totally devoid of any sudden or sharp pain.

TABLE II. PAIN IN ECTOPIC PREGNANCIES

Sudden sharp pain with fainting spell	32 cases
Sudden sharp pain without fainting spell	33 cases
Sudden sharp pains following 2 to 3 weeks of intermittent colicky pains	16 cases
Colicky pains	19 cases

Temperature on Admission (Table III).—The temperature on admission to hospital was, in the majority of instances, practically normal. In 20 cases, it ranged from a low of 97° to 98.6° F., while 65 cases presented fractional gradations from normal to 100°. In the remaining 15 cases, variations fell within limits ranging from 100° to 102°. The opinion holds that the febrile reaction is an expression of peritoneal irritation caused by the extravasated blood. But it is equally

TABLE III. ADMISSION TEMPERATURE

TEMPERATURE	NO. CASES
97.0 - 98.6	20
98.8 - 100.0	65
100.2 - 101.0	10
101.2 - 102.0	5

certain that the degree of temperature is not an index to the amount of intraabdominal blood. We have noted that oftentimes minimal amounts of either free or clotted blood in the culdesac have given higher febrile elevations. On the other hand, patients with abdomens markedly distended with lost blood, presented normal or subnormal temperatures. Here, factors of more grave consideration than mere aseptic peritoneal irritations come into play, the development of a hemorrhagic shock state, and under such circumstances, the heat regulating mechanism succumbs as part and parcel of the general impairment and collapse of all the vital activities. (Table IV.)

TABLE IV. RELATIONSHIP BETWEEN W.B.C. AND TEMPERATURE

HOSP. NO.	TEMPERATURE	W.B.C.
26	98.6	21
30	98.0	32
49	99.8	22
166	97.8	21
168	99.8	16
21	101.0	34
142	99.0	20
19	98.0	36
141	102.0	31

Leucocytic Counts (Table V).—The leucocytic response in this series was decidedly noncommittal from a diagnostic point of view, since it varied from a low normal of 5000 to as high as 42,000. And between the two extremes, there occurred a marked variation. Fully three-fourths of the cases presented a leucocytosis, with the majority ranging between 11,000 and 20,000. Counts above this figure were singularly few. But the item of diagnostic importance is that counts in the 20, 30, and even 40,000 column do not exclude ectopic gestation in preference to inflammatory reactions, when the differential swings between these two entities. Like the febrile reaction, the leucocytosis is in response to peritoneal irritations. Whereas in inflammatory processes, febrile courses and white counts are sustained from day to day (as long as the infected focus retains its virulence), in ruptured ectopic gestations, they subside in terms of hours, to rise again when fresh blood is poured out into the abdominal cavity.

TABLE V. LEUCOCYTIC COUNTS

COUNT IN THOUSANDS	NO. OF CASES
— — 5.0	1
6.0 — 10.0	23
11.0 — 15.0	34
16.0 — 20.0	23
21.0 — 25.0	11
26.0 — 30.0	3
31.0 — 35.0	4
36.0 — +	①

① = 42,000

Erythrocytic Counts (Table VI).—The red cell counts reveal a marked variation. In the present series, 7 cases presented normal counts, whereas the numbers in 3 cases dropped to the one million mark; and between these high and low levels, there are all the intervening gradations. This marked discrepancy in the red cell counts as they appear in cases of ruptured ectopic gestation may be explained on the basis of the type of hemorrhage. Referring to Table VII, we note under “*General Conditions*” that all the cases listed pre-

TABLE VI. RED CELL COUNTS

COUNTS (IN MILLIONS)	NO. CASES
5.0 — 4.5	7
4.4 — 4.0	6
3.9 — 3.5	17
3.4 — 3.0	16
2.9 — 2.5	23
2.4 — 2.0	18
1.9 — 1.5	8
1.4 — 1.0	3
Highest count	5,184,000
Lowest count	1,000,000

sent evidence of an acute illness, of hemorrhagic shock (as evidenced by the pulse, low pressure, and, in some instances, by air hunger), and of a severe anemia as reflected by the extreme pallor. Though these descriptions are terse and succinct (and they are copied verbatim from the charts), they convey a graphic portrayal of the severity of the clinical state. Further confirmatory testimony of this gravity is the surgeon's attestation of the presence of large quantities of free and clotted blood at the time of the operation. But despite this picture of extreme anemia and profound loss of blood, we observe in the third column of Table VII a discordant note; the red cell counts are normal, or nearly so. This discrepancy between relatively high counts and a severe state of exsanguination is due to the fact that not sufficient time had elapsed for the absorption of an adequate amount of fluid lymph from the tissues into the circulation and thereby dilute the remaining intravascular blood. Obviously, red cell counts

TABLE VII. RELATIONSHIP BETWEEN SUDDEN PERSISTENT SEVERE HEMORRHAGE AND RED CELL COUNT

HOSP. NO.	NO. HOURS AFTER SPELL	R.C.C.	AMT. BLOOD IN PERITONEAL CAVITY	GENERAL CONDITIONS
52	2	4,116,000	Large quantities, free and clotted	Acutely ill
170	3	4,900,000	Large quantities, free and clotted	Shock, very pale
49	4	3,900,000	Large quantities, free and clotted	Anemic
63	4	4,900,000	Large quantities, free and clotted	Shock, no pressure, pulse 140
58	8	3,500,000	Large quantities, free and clotted	Shock, b. p. 84-60
78	16	3,500,000	1½ quarts, free and clotted	Acutely ill, b. p. 70-52
16	22	3,590,000	Tremendous, free and clotted	Very ill
6	24	4,000,000	Large amount, free and clotted	Shock
45	24	3,800,000	Moderate amount, free and clotted	Anemic, pulse 110

give only an accurate index of the proportions between the fluid and the corpuscular elements of the blood lost, provided, of course, that the relationship has not been disturbed by the addition to or absorption of fluids by the circulation. And such is the case immediately, and even for hours following a sudden brisk and profuse hemorrhage.

In contradistinction to the relatively high counts of the preceding cases under consideration, we observe in Table VIII that the patients presented decidedly low figures. In the former series, we are dealing with counts in the 5, 4, and 3,000,000 columns; in the present series, we note counts in the 2 and 1,000,000 figures. Briefly, in the latter cases, the counts supplement and corroborate the existing anemia and

the large amount of blood loss noticed at the time of operation. Further, in these cases, the surgeon observed that most of the blood in the peritoneal cavity was old and clotted. These patients have been bleeding in small gradual amounts in terms of days and even weeks; and thereby sufficient time has elapsed for a correspondingly gradual recovery and restoration of the normal intravascular blood volume, an increase in fluid volume at the expense of diminution of the corpuscular element. This reduces the red cell counts to the proper levels whereby they serve as indices of the severity of the hemorrhage.

TABLE VIII. RELATION BETWEEN INTERMITTENT BLEEDING AND RED CELL COUNT

HOSP. NO.	DURATION OF COLICKY ATTACKS	R.C.C.	AMOUNT OF BLOOD
40	4 days	2,070,000	Large amount free and clotted
87	4 days	2,500,000	Free and clotted
68	5 days	1,900,000	Two quarts
31	5 days	2,400,000	Free and clotted
55	7 days	1,680,000	Large quantities
106	7 days	2,500,000	Free and clotted
30	10 days	2,400,000	Two quarts free and clotted
109	2 wk.	1,960,000	Free and clotted
32	2 wk.	2,200,000	Large quantities all clotted
73	3 wk.	2,600,000	No free blood
110	3 wk.	1,600,000	Large quantities little free blood
41	3 wk.	2,650,000	Moderate amount free
42	3 wk.	2,290,000	Free and clotted
11	4 wk.	1,000,000	Old clots very little free

Analysis of Deaths.—There occurred in this series 9 deaths; of these, 2 died several days following operation of a peritoneal sepsis, whereas, in the remaining 7, death was due directly to hemorrhage. This high mortality rate may be satisfactorily accounted for, and perhaps even justified, by taking into consideration that many of these City Hospital patients are mismanaged prior to hospitalization and often neglected, arriving at the institution practically moribund. Then, too, these statistics cover a period of ten years' work, and formerly the present-day simple transfusion was a complex, time-consuming ritual. This may explain the cryptic notation left on record: "died awaiting transfusion." (Table IX.)

We have deemed it advisable to present these statistical data as a background to the major theme, that of autotransfusion. The term autotransfusion has been accepted, somewhat reluctantly, as cumbersome and ill-chosen, because of the antithesis of the component parts. Rather, we propose the substitution of a more appropriate terminology, and we suggest *autohemofusion*. This work, which includes 11 autohemofused cases for ruptured ectopic with profuse hemorrhage, was done at the Harlem Hospital. We do not assume the attitude that all of these cases would have ended fatally in the absence of

autohemofusion, such a position is scarcely tenable. . But we are well within clinical reasoning in stating that all of these patients were in need of blood from our present-day preoperative standards. The majority of these patients were admitted to the hospital in a state of profound exsanguination; when in such instances, neither a relative to act as donor nor the financial wherewithal was forthcoming within a reasonable margin of safety, autohemofusion served more than the mere satisfaction of a scientific whim. It proved life-saving.

TABLE IX. ANALYSIS OF DEATHS

HOSP. NO.	HISTORY	R.C.C.	NOTATIONS
111	Acutely ill; pulse weak; rate 130	3,800,000 After saline 2,080,000	Died 12 hours after operation
94	Pulseless; air hunger; dehydrated; anemic	2,890,000	Died awaiting transfusion; no operation
107	Acutely ill; dyspnea; pulse 120; rose to 150 during operation	1,490,000	Died a few hours after operation
35	Pulseless; no pressure; very anemic; rapid, short, respiration; skin cold; thirsty; marked pallor; restless; pulse 110	No data	Died on table 5 minutes after operation began
19	Extreme pallor; pulse hardly perceptible; no pressure	2,400,000	Died awaiting transfusion; operated
63	Marked pallor; no pulse	4,900,000	Died few hours after operation; transfused 400 c.c.
89	Extreme shock; no pulse; extremities cold; moribund	2,500,000	No operation; died awaiting transfusion

The method of disposal of the free intraabdominal blood found at the time of operation has always been a mooted question. And this immediately broaches the subject of peritoneal absorption, a full discussion of which would rekindle a highly technical phase of the problem. Briefly, some surgeons merely prefer the removal; others insist that its presence in the abdominal cavity may serve as a potential source of postoperative infection. Categorically opposed to this view are those who advocate the retention of the free blood on the basis that it is reabsorbed. The first premise is, on the face of it, well within clinical plausibility, though not of a striking nature; whereas the second hardly holds, because when absorption does occur, the red cells are practically destroyed, and the absorptive process is mainly for the purpose of eliminating a foreign (physiologically inert) body from the abdominal cavity.

Historical Background.—The utilization of the free intraabdominal blood for infusion purposes in cases of ruptured ectopic gestation was first due to the effort of Jahonnes Thies² of Leipzig in 1914. Several decades prior to this date, English medical literature contains several clear and unmistakable references to the advisability of autohemofusion; but in no instances did the English clinicians refer to or actu-

ally perform it for a cause of tubal rupture. Nor did this innovation find favor among American gynecologists, although American surgeons have found it to be expedient in cases of ruptured spleen, ruptured liver, and in cases of major neurologic operations. This last item has the impress of approval of no less eminent an authority than Harvey Cushing.³ Thus, Thies' name remains unchallenged as the originator of autohemofusion for ectopic gestation; and since his initial trial, the method has been in vogue in Germany.

Of recent date, Farrar,⁴ unable to autohemofuse in ruptured ectopic cases, owing to the lack of adequate "teamwork," has resorted to the use of the blood lost during the surgical removal of fibroid uteri. In all of the cases reported, this procedure appears meddlesome and quite unnecessary; but it is conceivable, of course, that in the rare case of hysterectomy, the blood loss may reach such alarming proportions during the operation to warrant or even necessitate intravascularization of the lost blood. A more striking innovation, however, was the use of the free blood in a case of postoperative accidental hemorrhage, when this method, in the absence of an urgent *mise en scène* of the ordinary transfusion, because of the time element, proved life-saving.

In Canada, Appleby⁵ has reported nine cases of autohemofusion for ruptured ectopic. It would appear that not all of these cases were in urgent need of blood; his experiences suggest and warrant the removal of the fresh blood from the abdominal cavity in all such instances for reintroduction into the vascular system, rather than leaving it for an eventual physiologically useless peritoneal absorption.

The latest American reference is by Maynard and Reis.⁶ They were recently confronted with a ruptured ectopic patient whose vitality was fast ebbing away in a small rural community in Vermont where transfusion was not available and the hospitalization of the patient to the nearest center was not possible; as a last measure they resorted to autohemofusion with successful result.

Statistical Survey and Comparative Evaluation of Autohemofusion (Table X).—We have gathered from the literature, mainly German, 270 cases of autohemofusion for ectopic rupture associated with a severe or moderately severe hemorrhagic shock. Adding to this number our 12, there is a total of 282 cases. In this series, there have occurred six deaths, a mortality rate of 2.2 per cent. Before attempting comparisons with the rates reported by Farrar,⁷ Williams,⁸ Oastler,⁹ and Schumann,¹⁰ in their respective series, we wish to call attention to the fact that, whereas the autohemofused cases were all poor surgical risks by reason of a severe exsanguination, the groups reported by the above compilers include both the good and the poor risk, the ruptured and the unruptured case. This disadvantage notwithstanding, the mortality rate of the autohemofusion compares fa-

vorably with Williams' and Schumann's rate, most favorably with Oastler's, but pales somewhat in comparison with Farrar's figure of less than one per cent. Analysis of the 6 deaths as hitherto listed in Table X reveals at least three avoidable failures, one due to an obvious error in technic, and two due to biologically changed blood; that blood should not have been used, and what is more, autohemo-

TABLE X. COMPARISONS OF MORTALITY RATES

I. Total No. cases autotransfused		270
Deaths		6
Mortality rate		2.2%
II. COMPILER	NO. OF CASES	MORTALITY RATE
Farrar	309	0.97%
Williams	147	2.70%
Oastler	106	6.50%
Schumann	307	2.60%
III. Cause of death:		
Obvious error in technic		1
Patient moribund at time of operation		2
Ascribed to biologically changed blood		1
Hemoglobinemia		1
Cause not specified		1

fusion was not indicated. At all events, the item productive of death which the inexperienced surmises as the most common, namely death from embolic processes, is most conspicuously absent.

Modus Operandi.—On the basis that autohemofusion is of rare indication, but that when needed, it is an extremely urgent measure, it is well to reduce the method to its utmost simplicity. The greatest sphere of usefulness is in the small community and in the small, sparingly equipped hospital which does not afford the luxury of an emergency transfusion ensemble, where expert transfusionists, where interns and sera for grouping are not available within a margin of safety. Under such circumstances, the perfect execution of some elaborate operating room ritual "teamwork" is not possible; and the patient's life depends solely on the expedient endeavors of the surgeon and a single assistant. Consequently the technic devised by Farrar and the one suggested by Hahn,¹¹ though useful, are too elaborate to employ in the rare urgencies.

The method is as follows: The abdomen is prepared in the usual manner with the added cleansing by saline. This extra preparatory precaution is favored in order to avoid contaminating the blood with iodine or alcohol in the course of its removal. This is a minor item, and need not be insisted upon. The patient is kept in a horizontal position, in order that the free blood may gravitate into the pelvic basin, and the removal may be rendered easier. A saline infusion is begun (by the surgeon if no intern is available) and so graduated that the patient receives from 5 to 6 drops per minute. This minimal amount of saline will silence those who stress the deleterious effect of an increased fluid volume as a factor productive of increased blood pressure and reactivation of the bleeding. If an assistant is available, the infusion is begun simultaneously with the initial abdominal

incision. When the intestines are exposed, 25 c.c. of sodium citrate solution (2.5 per cent) are poured into the abdominal cavity. Neglecting the pathology, the blood is immediately scooped out by the use of a small service cup; it is then poured over 12 layers of citrate saturated gauze into a graduated receptacle containing approximately 50 c.c. of citrate solution. Stress is laid on the use of ordinary utensils, such as are always available in every operating room, thus avoiding a hurried search for implements in any other departments of the hospital. Some have suggested the use of a ladle. The ordinary operating table service cup is just as useful. In the absence of a porcelain graduate, an ordinary glass graduate or a large specimen basin will suffice. The gauze is placed thereon by the nurse, and held in place by a sterile elastic band. It is necessary for the assistant at the operation to gently stir the blood citrate mixture. The clots are brushed aside. When all free blood has been removed, the blood-soaked gauze is washed by pouring through it about 50 c.c. of saline. This gathers the enmeshed cells. The citrate blood is then handed to the circulating nurse who pours it into the saline infusion bottle already in working order. We prefer the use of a small caliber needle. The fluid running into the circulation is a blood-saline mixture; it will run freely; and if perchance a clot (of the proportion whereby harm may accrue when in the circulation) reaches the small caliber needle, it will immediately plug the lumen, and the inflow automatically ceases. Obviously this method assures the absence of any embolic complication. We prefer to run the mixture at a temperature of about 105° F., realizing that these patients are either in shock or on the verge of shock, and consequently present a disturbance of the heat-regulating mechanism. If the solution is permitted to enter the circulation at a lower temperature in amounts above 100 c.c., the usual chill does not occur,

TABLE XI. AUTOTRANSFUSED CASES

HOSP. NO.	AGE	PARA	DURATION PERFOR- ATION	CONDITION ON AD- MISSION	W.B.C.	R.C.C.	AMOUNT RE- INFUSED
153	27	1	30 hours	Anemic; dyspnea of hemorrhage; pulse in O.R.-148; b.p. 80	20,000	2,500,000	475 c.c.
174	22	0	24 hours	Acutely ill; marked pallor; thirst	18,400	2,400,000	700 c.c.
164	28	3	14 hours	Acutely ill; M.M. markedly pale	13,000	3,100,000	400 c.c.
166	33	1	17 hours	B.P. 90-70; acutely ill; marked pallor		3,800,000	525 c.c.
167	29	1	16 hours	Acutely ill; thirst; pallor	20,000	3,800,000	375 c.c.
168	27	1	72 hours	B.P. 80-45; acutely ill; pulse during op. 150	16,200	3,600,000	500 c.c.
171	21	0	48 hours	Acutely ill; pulse 160; no b. p.	34,000	2,500,000	375 c.c.
172	19	0	26 hours	Seriously ill	14,800	3,200,000	475 c.c.
169	24	1	24 hours	Acutely ill; red pallor	13,000	3,600,000	250 c.c. (lost)
170	34	No data	3 hours	State of shock	25,000	4,950,000 4 days later 3,800,000	500 c.c.
163	27	2	18 hours	Marked pallor; acutely ill; b. p. 76-40	25,000	2,950,000	410 c.c.

provided the patients are under the influence of an anesthetic for half an hour or so following the cessation of the infusion. (Table XI.)

CONCLUSIONS

1. We suggest the term autohemofusion in lieu of the ill-chosen autotransfusion.

2. Eleven cases of ruptured ectopic gestation with sudden profuse, or moderately profuse hemorrhage have been autohemofused.

3. The procedure is of distinct value for the utilization of the free intraabdominal blood.

4. The red cells of the intraabdominal free blood have been found microscopically normal as late as seventy-two hours after the time of the rupture.

5. Autohemofusion is blood economy. Even for patients who are not in imminent danger, i.e., not in urgent need of blood, the salvaging and vascularization of 300 to 500 c.c. of blood (the usual amount found) will help toward an uneventful postoperative reaction and a more rapid recovery.

6. Autohemofusion dispenses with the need of a transfusionist, grouping sera, group testing, and eliminates the often distressing financial burden.

7. Autohemofusion is a life-saving therapeutic measure in the occasional ruptured ectopic with a sudden and overwhelming hemorrhage, particularly when such a catastrophe occurs in a small community where the ordinary transfusion is not available within a safe margin of time.

REFERENCES

- (1) *Schumann, E. A.*: Extra-Uterine Pregnancy, Text, New York, 1921, D. Appleton, p. 118. (2) *Thies, J.*: Zentralbl. f. Gynäk. 38: 1191, 1914. (3) *Davis, L. E., and Cushing, H.*: Surg. Gynec. Obst. 40: 310-322, 1925. (4) *Farrar, L. K. P.*: Surg. Gynec. Obst. 44: 454, 1929. (5) *Appleby, L. H.*: Canad. M. A. J. 15: 36, 1925. (6) *Maynard, R. L., and Rees, W. T.*: J. A. M. A. 92: 1758. (7) *Farrar, L. K. P.*: Am. J. Obst. 79: 733, 1919. (8) (9) (10) *Schumann, E. A.*: Vide supra, p. 177. (11) *Hahn, E. U.*: Surg. Gynec. Obst. p. 107.

975 PARK AVENUE.

ABORTION IN RELATION TO FETAL AND MATERNAL WELFARE*

BY FRED J. TAUSSIG, M.D., ST. LOUIS, MO.
(Concluded from November)

III. CAUSE AND PREVENTION OF ABORTION

Spontaneous Abortion.—Without specifying the well-known forms of gynecologic ailment (myoma of the uterus, retroversion, lacerated cervix, pelvic infection) that may be a factor in the spontaneous interruption of pregnancy, and without listing the different forms of trauma (fall, accident, coitus, fright) that may occur in women having an irritable uterus, bringing about expulsion of the ovum, it would be well to consider some of the causes that have been more recently emphasized and are to some degree the outgrowth of changes in our present living conditions. The increased excitement and speed of modern life, especially the use of the motor car, is doubtless a predisposing factor to spontaneous abortion in many sensitive city-bred women. The rapid increase in the number of chronic sinus infections in the smoke-laden crowded atmosphere of cities leads to toxic conditions that interfere with the proper development of the embryo, and so lead to abortion. Curtis has stressed the fact that such focal infections have an important bearing on the etiology of habitual abortions. Endocrine disturbances are also apparently on the increase and, playing as they doubtless do an important part in the early nutrition of the embryo, predispose to interruption of the gestation. Syphilis has often been rated an important cause of abortion, but a careful analysis of the facts shows that in the first four months of pregnancy syphilis rarely damages the fetus or the placenta. Acute infectious diseases and kidney lesions occasionally result in abortion but less often in the first half of pregnancy.

Whether the number of spontaneous abortions can be materially reduced by earlier and more careful prenatal care is a matter of conjecture. There is no evidence as yet that any such result has been obtained but it is reasonable to suppose that the early recognition and prompt correction of the underlying factors in the tendency of abortion will save a certain number. Of even greater significance is the preconceptional prophylaxis. If the uterus is held in place with a pessary, the cervical infection or tear corrected, iodine or thyroid given in accordance with the basal metabolic rate, points of focal infection eliminated, and, improved physical hygiene of both husband

*Prepared for the White House Conference, Committee on Prenatal and Maternal Care, Subcommittee on Factors and Causes of Fetal, Early Infant and Maternal Morbidity and Mortality, Hugo Ehrenfest, M.D., St. Louis, Chairman.

and wife instituted, a certain number of the subsequent pregnancies may be carried to full term. We still however meet with failure in a high percentage of these cases of so-called "habitual abortion." The woman who in spite of many spontaneous abortions, still clings to the hope of having a child, is surely deserving of our sympathy and all the help science can give her. Here is an important field for additional research.

Criminal Abortion.—Previous to 1900, the most common cause of criminal abortion was illegitimate pregnancy. Since that time the world has undergone revolutionary changes affecting the lives of women and there has occurred simultaneously a marked increase in the number of wilfully interrupted pregnancies. We can divide the factors that have brought this about under four main heads:

- (1) Decrease in infant mortality.
- (2) Decrease in authority of church and state.
- (3) Economic distress.
- (4) Changed social position of woman.

The advance of medicine in infant feeding and the prevention and treatment of infectious diseases has led to a reduction in the infant death rate of about 50 to 60 per cent. This marked saving of lives, formerly sacrificed, has had its repercussion in a desire to prevent further conceptions. Failures in such contraceptive measures, has resulted in a desire to abort the pregnancy. Thus the number of abortions has increased to an astonishing degree among the mothers of three or more children.

The World War brought in its wake a loss of faith and disrespect for the decrees of church and state. The state had for patriotic reasons demanded of its citizens as many children as possible. With the fall of imperial governments the masses have come to realize that the children were but cannon-fodder to support the ambitions of their leaders, who only too frequently saw to it that their own families were properly restricted in number. A growing suspicion also arose that back of the strict doctrines of many churches opposing the limitation of families lay rather the desire to increase the number of their own adherents than any unselfish interest in the welfare of the masses. The skepticism has unquestionably played an important part in the increase of abortions.

Economic distress has however been the most powerful and immediate factor in the increase. This is of course more true of those European countries such as Germany, Poland, Austria, Russia and the Balkan States, where privation made any increase in the family a real calamity. The housing shortage in the towns was an added reason for frequent abortions, especially in Russia. Now in the past year has come the plague of unemployment which has swept the world and left millions dependent upon charity of government doles for

their support. It is ineoneeivable that this is not producing efforts to prevent the birth of more persons into an already starving universe. How great will be the toll of lives from this source in the present year it is difficult to predict.

Finally the movement for women's rights before and since the World War has led up to a pronounced change in woman's economic and social status. In place of a meek resignation to fate, many women are now claiming a right to determine for themselves whether their life is to be spent in breeding more and more children. Greater freedom of sex life has also resulted in a change in ethical standards. Women employed in industry are anxious to avoid a pregnancy and additional children that will interrupt their life-work and add to their burdens. In France the number of women employed in labor is said to equal the number of men.

The more immediate causes of induced abortion have been studied in Russia, where its legalization makes possible a direct analysis. It was found by Dr. Genss, based on over 200,000 abortions, that these causes vary somewhat in city and country districts as shown in Table VII.

TABLE VII. IMMEDIATE CAUSES OF INDUCED ABORTION (RUSSIA)

	TOWNS PER CENT	COUNTRY DISTRICTS PER CENT.
Poverty	66.4	58.2
Illness	19.3	29.7
Desire to conceal pregnancy	1.6	7.3
Infant at breast	12.7	4.8

The manner in which the abortion was produced whether by midwife, physician, or the patient herself, has also been given some study. According to the report of the New York Department of Health a very high percentage was due to self-medication. There has been considerable criticism of the ease with which these abortifacients can be obtained by the women from drug stores and advertising agencies. A not inconsiderable number of women are said to lose their lives through taking an overdose of such medicines. The number of illegal abortion operations performed is about equally divided between doctors and midwives, according to the reports from New York.

When we come to a discussion of the means to prevent these abortions, we tread on dangerous ground. There is still too radical a difference in the ethical viewpoint of different groups to suggest any solution. One thing stands out clearly, however. The attempt in the past thirty or forty years to control the abortion evil by legislation has proved a dismal failure. Even in those cases where the abortion has led to the death of the mother and where all the evidence is at hand, so that the guilt of the offending physician or midwife is clear to all, the technicalities of the law and the disposition of the jury to

pardon the offender, has resulted in about 19 acquittals out of every 20 cases tried. The difficulty of conviction in these criminal cases is increased by the practice of these physicians to do the abortion behind a screen so that the patient cannot actually see who is doing the operation. All attempts to make the laws more rigid and the punishment more severe have merely led to greater evasion and concealment without any material decrease in the incidence of the procedure. The results of the latest effort along this line by Mussolini's government in Italy await further development for a definite conclusion.

A growing movement in this country and abroad to bring about a decrease in abortions by a spread of contraceptive teaching among the poorer classes and unrestricted distribution of the means of preventing conception deserves some consideration. Krassilnikian voices the opinion of a group of German physicians in enthusiastic support of this program. It cannot, however, be denied that the means for preventing conception not infrequently fail, so that pregnancy results in spite of them. The natural reaction of the woman who feels it to be her granted right to determine the number of her children, is that, if the contraceptive failed, she then must also have the right to interfere with an early pregnancy. Unfortunately she seems entirely unaware of the risk to life and future health inherent to this procedure. Such are the whirlpools into which we drift, when we go deeper into this subject.

Perhaps the greatest good may come in this difficult situation by a more thorough and sympathetic understanding of the abortion problem by all concerned. Such a program would begin with an unbiased and careful search for the conditions actually existing, and a frank facing of the facts as they are thus revealed. The mask that has been lifted from our knowledge and discussion of venereal diseases, must also be lifted from this problem of abortion. On the one hand woman must be taught that maternity is one of the greatest blessings in life, that a home without children lacks fulfillment. She must realize that she has duties to her children as well as to her profession and appreciate that there are duties to the unborn child within her womb. Few women appreciate the fact that as early as the first month after conception the child already has all the essential organs of the adult, that sex is determined though not easily recognizable, that this object which they wish to destroy is not a formless mass of flesh but a highly developed organism whose future cannot be predicted. Furthermore she must be made to realize the serious dangers to her life and health attendant upon every criminal abortion. Many a woman can be dissuaded from her desires for abortion when this has been explained. On the other hand the state even more is in need of education. It should give proper support and show due respect to those women who at the expense of pain and danger to their lives have performed this

duty so vital to the future of the race. Maternity has never been duly rewarded or properly provided for. The present federal income tax exemption of \$400.00 for each child is ridiculously small. A more liberal policy by the government would help to alleviate the burdens now placed upon parenthood. While the bearing of children should thus be encouraged, the state should give more consideration to the plight of those mothers of many children, whose depleted physical condition and poverty make further childbearing an intolerable burden. Whether the limits of therapeutic abortion (now permitted in case of disease threatening the life or likely to impair permanently the health of the mother) should be further extended, is a question that is being debated in many countries. The discovery of a more certain type of contraceptive or the sterilization of such women, now accomplished with minimal risk, may make such abortions no longer necessary.

IV. MATERNAL MORTALITY OF ABORTION

Statistics.—Based on a population of 120,000,000 persons, and an annual birth rate of approximately 2,500,000 (20 per 1000), an estimate of 700,000 abortions annually has already been made. The average maternal death rate following abortion for the civilized world is approximately 2.1 per cent. Based on 700,000 abortions, this would mean that 15,000 women lost their lives in the United States every year as a result of abortion.

Of course only a relatively small proportion of such deaths are properly recorded as to their cause. If we take the figures obtained by the Children's Bureau maternal mortality study we find a rate of 15 deaths following abortion per 10,000 live births among the white women and 21 deaths following abortion per 10,000 live births among the colored women. Dividing the 2,500,000 births annually in the United States as 350,000 colored and 2,150,000 white, we find that on a basis of registration alone, there should be only 735 colored and 3,225 white mothers who die annually from abortion. Compare this 4,000 with the more probable figure of 15,000 and we see the inadequacy of the registration statistics.

In the maternal mortality study of the Children's Bureau the case histories of all women whose deaths were assigned by the Bureau of Census to puerperal causes in 13 states in 1927 and in these same states and two others in 1928, were obtained by personal interviews with the attending physicians or midwives. Of the 7,380 deaths found to be due to strictly puerperal causes, abortions preceded 1,824, or 25 per cent. Of these 1,824 abortions, the types could not be ascertained in 237 cases. Of the remaining 1,587, 589 or 37 per cent seemingly were spontaneous, 794, or 50 per cent, were criminal, and 204, or 13 per cent, were therapeutic.

Of the 1,824 women who died following abortions 186 were single. These comprised 37 per cent of the 509 unmarried mothers whose deaths were included in the whole group. One thousand six hundred thirty-eight women who died following abortions were married.

Puerperal septicemia was the cause of 1,324, or 73 per cent, of the 1,824 deaths following abortions. Of the 794 deaths following induced abortions, 722 or 91 per cent were due to puerperal septicemia.

The deaths following abortions make a striking contribution to the maternal mortality rates from puerperal septicemia. Forty-five per cent of all the deaths assigned to puerperal septicemia in the states and years of the study were preceded by abortions. Criminal abortions caused one-fourth of all the deaths assigned to puerperal septicemia.

Relation to Puerperal Mortality.—While the above figures indicate the number of abortion deaths in relation to puerperal deaths they do not show the relatively high *death rate per abortion*. This is due to the fact that the Children's Bureau has no definite data regarding the total number of abortions in the district covered by their survey. In the city of Magdeburg where such figures are available we find that the death rate from sepsis following abortion is seven times greater than that following childbirth. In the years 1924 to 1927 there were in Magdeburg 17,382 confinements with 24 maternal deaths from sepsis, a ratio of 1.4 per 1000 confinements. During the same four years there were reported 6,497 abortions with 61 maternal deaths from sepsis, a ratio of 9.4 per 1000 abortions. We have also figures available from Berlin for the years 1922 to 1926. These show that in 1922 out of 626 maternal deaths from puerperal sepsis 503 (over 80 per cent) followed abortion and for the five years, 1922 to 1926, the total was 2,387 maternal deaths following sepsis of which 1,886 occurred after abortion, or 79 per cent.

The figures obtained from the report of the English Ministry of Health in 1930 show an increase in the ratio of deaths from abortion to total female deaths from 1.9 per 1000 (1919 to 1923) to 2.6 per 1000 (1924 to 1928). Figures are available for 1926, 1927, and 1928 on the proportion of deaths to total puerperal mortality. They were 308 cases (10.7 per cent) in 1926, 297 (11 per cent) in 1927, and 301 cases (10.3 per cent) in 1928. The 1928 figures did not include 57 coroners' cases which would have brought the total to 358 cases. Even so, however, the figures are considerably lower than those in the United States and Germany. From Switzerland we have unusually complete reports giving the comparative death rate following childbirth and abortion as indicated in Table VIII. These figures show that during the last thirty years, maternal mortality following puerperal fever has been reduced by one-half. On the other hand, deaths due to abortion still remain at a high level and

exceed 20 per thousand. The average is 20 times higher than that of deaths following confinement. Lippmann claims that the maternal deaths from abortion have rather been underestimated than overestimated. Figures such as those of Schottelius in Hamburg, with 183 deaths out of 8,107 abortions or 2.1 per cent and Benthin of 1.9 per cent are considered insufficient. Schaefer from Berlin cites 6,270 abortions with 3.25 per cent mortality. Bleichroeder found a death rate of 3.36 per cent in 2,617 abortions. Kiefer reported 152 deaths out of 3,800 abortions (4 per cent). Dietrich's figures were even as high as $4\frac{1}{2}$ per cent mortality.

TABLE VIII. MATERNAL MORTALITY FOLLOWING CHILDBIRTH AND ABORTION
(SWITZERLAND)

YEAR	NUMBER OF BIRTHS	DEATHS FOLLOWING CHILDBIRTH	RATE PER 1,000 LIVE- BIRTHS	DEATHS FOLLOWING ABORTION	RATE PER 1,000 STILL- BIRTHS
1901	97,028	230	2.37	20	5.54
1902	96,481	180	1.87	16	4.56
1903	93,824	211	2.25	26	7.89
1904	94,867	209	2.20	48	13.98
1905	94,653	211	2.23	42	12.34
1906	95,595	148	1.55	43	12.74
1907	94,508	193	2.04	68	21.33
1908	96,245	169	1.76	58	17.99
1909	94,112	170	1.81	68	21.36
1910	93,514	133	1.42	49	15.53
1911	91,320	162	1.77	83	28.97
1912	92,196	159	1.72	59	19.83
1913	89,757	142	1.58	55	19.83
1914	87,380	124	1.42	64	22.87
1915	75,545	114	1.51	60	25.15
1916	73,660	119	1.62	60	26.97
1917	72,065	125	1.73	79	38.35
1918	72,658	126	1.73	83	37.28
1919	72,125	115	1.59	81	38.94
1920	81,190	154	1.90	81	33.29
1921	80,808	169	2.09	81	34.25
1922	76,290	138	1.81	54	24.04
1923	75,551	105	1.39	63	29.40
1924	73,508	79	1.07	41	19.94
1925	72,570	106	1.46	39	20.11
1926	72,118	88	1.22	54	29.27
1927	69,533	81	1.16	35	20.00
1928	69,594	83	1.19	40	23.01
1929	69,006	83		45	

Relation to Manner of Abortion.—There is a marked difference in the death rate between cases that abort spontaneously and those that are induced. The former are rarely accompanied by fever whereas the latter are very commonly infected. In afebrile abortions the death rate as given by Heynemann is between 0.05 and 0.5 per cent. In febrile abortions, on the other hand, the death rate runs up to 4 or 5 per cent, and where peritonitis or septicemia has occurred, the mortality is as high as 60 to 70 per cent.

Relation to Race.—The figures from the Children's Bureau for the United States show 1,567 deaths following abortion among white women and 257 among colored women. Relating these figures to the number of live births of white and colored in the years and states of the study we find 15 deaths following abortion per 10,000 live births among the white women and 21 deaths following abortion per 10,000 live births among the colored women. The excess among the colored consisted primarily of spontaneous abortions. According to Holmes, Mussey and Adair the difference in this group of spontaneous abortions was 3.7 deaths among the whites and 7.9 deaths among the blacks per 10,000 live births. This difference may in part be explained by the frequency of complication in the blacks with myoma of the uterus and in part to the poorer economic condition, ignorance concerning principles of cleanliness, and the improper medical care rendered these colored patients.

Cause of Maternal Deaths.—In the group of spontaneous abortions the most important factors in mortality are poverty and lack of cleanliness, neglect and delay on the patient's part, and improper management by the physician or midwife in attendance. Hospital facilities are amply provided for in most portions of the United States, although of course in the country districts the question of distance and transportation brings up complications. In the illegal cases the cause of maternal deaths lies, on the one hand, in the undercover conditions, the ignorance and carelessness of the abortionist, and, on the other hand, is due to the inherent dangers of hemorrhage, perforation and infection attendant upon every such criminal interference. In the therapeutic abortion done by physicians after consultation, under proper surroundings, even though the physical condition of the mother may be very bad, the death rate is far less than in the criminal cases.

Ways of Reducing Maternal Mortality.—As already suggested the problem of reducing maternal mortality from abortion is not so much improving hospital facilities as utilizing to the fullest degree the facilities that are available. The medical profession should insist upon the treatment of these cases under hospital conditions wherever possible, not only to protect the doctor from false accusations, but because the required therapeutic procedures can thus be more safely carried out. Too little attention had been paid in the past in the curriculum of medical schools to the thorough training of students in the proper handling of these cases. This condition which faces every practitioner early in his professional career is not given due consideration in the teaching schedule. A very large proportion of the illegal cases sooner or later come to physicians for relief of complications and upon proper management at such times the life of the patient may depend. When we consider that abortions occur in the ratio of 1 to 3 confinements and that the death rate is seven times

greater than that of confinements, the time spent in training medical students in the recognition of the complications and treatment of abortion is deplorably insufficient.

Since a large proportion of the deaths from abortion are due to septic infection it is evident that no material reduction in mortality can be attained until we know more about the treatment of this condition. All attempts thus far with autogenous vaccines and streptococcus antitoxins have resulted in failure. It is to be hoped, however, that the intensive studies now being made in the control of these blood stream infections will result in some measure of success that will reduce the appalling mortality now prevailing.

The Russian Experiment.—Mention has already been made of the reports from Russia indicating a marked decline in the maternal death rate through the performance of legal abortion as a hospital procedure under aseptic precautions by regular physicians in place of the secret abortions done at home by charlatans or midwives. At Moscow in 1926, 29,306 artificial abortions were performed in the hospitals without a single death. On the other hand, out of 2,683 women admitted to Moscow hospitals after secret abortions there were 35 deaths (1.2 per cent). At Saratoff, in 1925, 2,366 abortions were induced at the hospital without a death while there were 7 deaths from sepsis in 1,026 cases of secret abortion. Leaving out of consideration for the present the moral and religious aspects of legalized abortion, the tendency of such legalization to increase the total number of abortions, and the unquestionable increase in the morbidity following such procedures, it cannot be denied that legalization has resulted in a definite decline in the maternal death rate from sepsis in Russia. How far it will be possible for other countries under totally different social conditions to adapt the results of this Russian experience for their own needs is a problem for the future to determine.

V. MATERNAL MORBIDITY AFTER ABORTION

In the wake of this tendency to an increase in instrumental interference with early pregnancy come a host of complications. Krassilnikian cites the experience of Schwarewa, Krasowaky and Makarjaw who report 7,522 legally induced abortions in Moskow with the following results: In 28.9 per cent there were some complications during the curettement, and in 0.09 per cent perforation resulted. In 4.1 per cent complications immediately followed the operation, and in 4.5 per cent the pathologic condition did not develop until one to three months later. From many other sources we have records of prolonged labor in confinements subsequent to induced abortion, an increased tendency to sterility, chronic pelvic infections, and evidence of definite psychic trauma as a result of such instrumental procedures. These complications occasionally follow spontaneous abor-

tion but are very much more frequent in induced abortion and especially in the secret illegal type. In estimating the damage to the human race by this scourge it does not suffice to stress only mortality figures; we must also attach due importance to the invalidism, suffering and disorganized family life resulting therefrom.

VI. SUMMARY

1. An estimate of 700,000 abortions annually in the United States is certainly no exaggeration of the actual condition. There is every reason to believe that an increase in this number is taking place with each decade similar to the experiences of other civilized countries.

2. This increase is the result partly of the decreased infant mortality, partly arises from the changed social and economic status of woman, and partly is the outcome of economic conditions resulting from the World War.

3. The increase is noticed primarily among married women who have three or more children.

4. All efforts to control the incidence of criminal abortion by legislation have resulted in failure.

5. Birth control may prove a factor in the reduction of criminal abortions, especially if more reliable contraceptive measures are discovered.

6. The maternal death loss from abortion in the United States has been estimated as 15,000 annually. Deaths from puerperal sepsis following abortions are relatively seven times as frequent as those from puerperal sepsis after childbirth.

7. The Russian experiment with legalized abortion indicates a definitely lower maternal mortality with operations done openly in hospitals than with secret, illegal operations as formerly.

8. A decrease in maternal mortality can be expected from improving the training of medical students and physicians in the proper management of abortion cases and from an increased knowledge concerning the prevention and treatment of septic infection.

9. The abortion problem, so vital to the human race, demands more careful and more open study, free from the trammels of political or religious dogma. Women should be taught to respect their duties, as mothers, to the social state, and the state in turn should be made to feel its obligations to motherhood, granting such relief, financial and otherwise, especially to those with many children, as will to the greatest degree avoid economic distress and promote the physical well-being of the mother.

10. The women of this country should be told that interference with pregnancy, even in its earliest stages, is not the harmless procedure they generally seem to consider it to be, but is a procedure inevitably associated with considerable risk to life and especially to future health.

REFERENCES

- Balthazar, Lacassagne and Doleris: Ref. in League of Nations Report. *Benthin*: Prakt. Ergebn. d. Geburtsh. 7: 129, 1917. *Bleichroeder*: Zentralbl. f. Gynäk. 50: 2214, 1926. Children's Bureau, Reports on Maternal Mortality, 1927, 1928. English Ministry of Health, Interim Report of Dep. Committee on Maternal Mortality, London, pp. 40-46, 1930. *Fraenkel*: Berl. Gynäk. Soc. Trans., Feb. 26, 1926. *Genss, A. B.*: Address at International Sex Hygiene Congress, London, 1929. *Genss, A. B.*: Personal Communication, July 16, 1930. *Heynemann*: in Halban-Seitz, Handbuch 7: 566, 1926. *Holmes, Mussey and Adair*: J. A. M. A. 93: 1440, 1929. *Hubbard, S. Dana*: Personal communication concerning work of Dept. of Health, New York City, Dec. 16, 1930. *Kordobovskiy*: Profib. Med. 7: 43, 1928. *Kiefer*: Zentralbl. f. Gynäk. 50: 2214, 1926. *Krassilnikian, S.*: Russische Erfahrungen mit der Freigabe der Abtreibung, Berlin, Verlag Emil Ebering, 1930. *Latzko*: Zentralbl. f. Gynäk. 45: 425, 1921. League of Nations: Report of Health Section of Secretariate on Maternal Mortality, Monthly Epidemiologic Report, July 15, 1930. *Liepmann, W.*: Deutsche Med. Wchnschr. 55: 350, 1929. *McIlroy, Louise*: In League of Nations Report. *Macomber*: Boston M. & S. J. 193: 116, 1925. *Ofterdinger*: Inaug. Diss., Hamburg, 1924. *Plass, E. D.*: Replies to Questionnaire on Abortion, Jan. 22, 1931. *Reichelt, H.*: Monatschr. f. Geburtsh. u. Gynäk. 84: 357, 1930. *Roesle, E.*: Ergebnisse der Magdeburger Fehlgeburtenstatistik, Statist. Jahrbuch d. Stadt Magdeburg, pp. 105-165, 1927. *Rothert, Frances C.*: Personal Communication, Dec. 19, 1930. *Taussig, F. J.*: Prevention and Treatment of Abortion, St. Louis, 1910, The C. V. Mosby Co.

ABDOMINAL OPERATIONS DURING PREGNANCY, WITH THE REPORT OF THREE CASES*

BY FRANK C. HAMMOND, M.D., Sc.D., F.A.C.S., PHILADELPHIA, PA.

(Professor of Gynecology, Temple University School of Medicine)

WHILE browsing recently through the 1849 edition of the *American Journal of the Medical Sciences*, I came across an article entitled "Cases of Premature Labour from Unusual Causes, With Remarks." The opening paragraph is "The saying of Hippocrates, that acute diseases in pregnant women are mortal, is full of truth when applied to their producing abortion." It shows that as far back as the time of Hippocrates there was a wholesome respect for the pregnant woman having an acute disease. At that period it was the prevailing opinion that when acute diseases were not intense enough to produce abortion, the patients were not in a worse condition for treatment, than women who were not pregnant; and, that when abortion did occur, before the disease was cured, death generally resulted.

As to operations upon the pregnant woman, they are not only justifiable but demanded, and there should be no hesitancy in performing abdominal operations of necessity upon this type of patient, because with improved technic, better asepsis and proper postoperative treatment the danger to life is practically no greater than for operations on the nonpregnant individuals. At times the question may be debatable as to whether or not operation during the pregnancy is justifiable but

*Read before the Obstetrical Society of Philadelphia, February 5, 1931.

it may be demanded for fear that delay until after confinement would seriously jeopardize the health or life of the patient. Under ordinary conditions there should be little danger of interrupting pregnancy. The exception to this rule may sometimes be the woman of great nervous irritability.

There are some who are of the opinion in general, that operations should not be performed at a period corresponding with the menstrual epoch, were the woman not pregnant, and that it would be well to avoid the third, fourth and eighth month. In acute abdominal conditions, however, one has no choice in this respect. Certain preexisting lesions are likely to grow worse during pregnancy.

The three cases herewith reported present unusual complications, 2 of which were debatable as to operative interference.

CASE 1.—B. C., white, aged twenty-six, married, para iv, was admitted to the hospital May 3, 1925, under the care of her medical attendant. The chief complaints were hematuria, pain in lower right quadrant of abdomen; abdominal enlargement and backache. She had not been well since birth of her third child nineteen months previously. During preceding three months complained of backache and annoying "sticking pains" in region of appendiceal scar (appendectomy 1923).

First noticed blood in her urine, about ten days previous to admission, which disappeared under medical treatment, in about one week. Severe distress in lower abdomen upon walking, and sensation as if pelvic organs were falling out.

Married seven years, 3 labors, normal deliveries, children all living, no miscarriages.

Last period March 28, 1925, about five weeks previous to admission. The next period was due April 25, but did not occur, the hematuria appearing at that time.

Physical examination disclosed marked tenderness in right lower quadrant of abdomen, with variable degree of rigidity, and a moveable suprapubic enlargement extending to umbilicus.

Uranalysis negative, excepting small amount of pus cells. Chromocystoscopy was done two days after admission. Functional renal test normal. Right ureter catheterized, 30 c.c. urine collected, and found to contain pus cells and staphylococci. Blood study normal in all respects.

I was asked to see this patient on the third day after admission. A diagnosis of pregnancy was made. Fundus at umbilicus. The fetal heart sounds were distinctly heard. Cause of right abdominal pain not determined. No rigidity at any time. Owing to increasing distress from right abdominal pain which persisted at the umbilical level, an exploratory operation was decided upon.

She was operated upon ten days after admission. Under ether anesthesia a mid right rectus incision was made and the right adnexa exposed. There was no undue pressure of the pregnant uterus against the tube and ovary. The ovary was normal in size. At the inner pole was a nodule occupying about one-eighth of the ovary. The question arose as to the possibility of this being the cause of the pain. The nodule was incised and found to be the early stage of a dermoid cyst. The ovary only was removed. The corpus luteum of pregnancy was not in this ovary.

About thirty-six hours after operation the patient stated that the peculiar agonizing pain she had suffered had completely disappeared. She made an uninterrupted afebrile recovery without aborting. She was delivered at term after being in labor about two hours.

CASE 2.—D. Y., white, married, aged twenty-six, para i, admitted to the hospital Oct. 23, 1926, under the care of her medical attendant.

Chief complaint: Sharp intermittent pain in lower right abdomen.

Awakened at 6 A.M. the day before admission, with sharp pain in lower right abdomen, and the abdomen was tender to the touch. Worked around that morning. While applying counter pressure with her hand, hoping to relieve the pain, she was surprised to feel a lump. Unable to sit or stand erect. Pain increased in severity during the evening and she was admitted to the hospital at 1:30 A.M.

Married ten months. Menses normal, thirty-day type. Last period two months previous to admission.

I saw her at the time of her admission. Temperature 98.4° F., pulse 110, rate 20. Normal pregnancy, the fundus at level of umbilicus. Just above middle third of Poupart's ligament right side was an ovoid mass about the shape and size of an ovary, easily palpated through abdominal wall, moveable and very tender. No abdominal rigidity. On bimanual examination this mass could be moved forward and downward. Its true nature was not determined. Appendicitis being eliminated, it was deemed best to hold her under further observation. Blood count: hemoglobin, 85 per cent; red blood cells, 4,660,000; white blood cells, 11,200; polymorphonuclears, 77 per cent; s.e. 18; uranalysis normal.

During the day of admission pain decreased. During the second and third days there was markedly increasing pain and tenderness; no rise in temperature. Operation was advised on the third day, and accepted on the fourth day, as there was no cessation of pain.

Under ether anesthesia a right rectus incision was made. The mass proved to be a soft hemorrhagic subserous fibroid tumor markedly inflammatory, pedunculated, broadly attached below right cornua of uterus. The pedicle was excised, and 3 interrupted catgut sutures inserted.

The patient stated about twelve hours after operation that the agonizing pain had disappeared. She made an afebrile uninterrupted recovery without aborting. Forceps delivery at term.

CASE 3.—E. L., married, para vii, white, aged twenty-eight, was admitted to the hospital by ambulance, 1:20 P.M., January 13, 1931. Her attending physician considered her symptoms were indicative of surgical interference and she was assigned to the surgical ward.

About 7 o'clock of the evening previous to admission, immediately following the lifting of a heavy two-year-old child, while in an awkward position, the patient was immediately seized with severe pains in lower abdomen, more marked upon the right side, and at the same time noted disturbance of vision, and remained in a dazed condition for a few hours. Her physician saw her about one hour after the occurrence, diagnosed pregnancy as one of the conditions present and ordered opium suppositories which afforded relief, and she had a comfortable night. During the morning of the day of admission the pains in the lower abdomen returned. Her physician was called toward noon, and considered emergency surgical interference was indicated, hence her admission.

Married nine years, 6 normal deliveries, one miscarriage.

Last menstrual period about September 1, 1930.

Excruciating pain in lower abdomen, intensified by slightest touch. Marked rigidity and tenderness in median line, between symphysis and umbilicus.

The surgeon requested examination by the obstetric service, Dr. J. O. Arnold saw her later in the afternoon, verified the diagnosis of pregnancy, and advised operative interference, having in mind the possibility of abdominal pregnancy. It was not possible to definitely outline the uterine wall on bimanual examination. As an aid a roentgenogram was taken with the following findings:

"A well-developed fetus is demonstrated, in which one can make out even the small bones of the hands. The fetus lies in a rather transverse position. The head cannot be demonstrated. In the anterior projection, a large oval soft tissue density is made out, which suggests the usual uterine shadow. In the lateral view, however, the usual outline of the uterus is missing. This fact, taken in conjunction with the rather high position of the fetus in comparison with its size, would seem to lend support to Dr. Arnold's suggestion of abdominal pregnancy. On the other hand, it is not possible to make a positive diagnosis."

The pain became localized in the left lower quadrant, which was the area of greatest tenderness and rigidity. At 7 P.M. (on day of admission) under ether anesthesia, Dr. Arnold made another bimanual examination, when he definitely outlined a normal intrauterine pregnancy. The abdomen was then opened by a median suprapubic incision. The left side was examined first, and torsion of the left broad ligament found with enormous distention of the veins in the broad ligament distal to the constriction, extending well out into the left lateral wall of the pelvis. The torsion was released and the structures dropped in situ. The right side was then explored, and all structures found normal. The left broad ligament was again inspected and the veins were noted to have markedly collapsed.

The patient stated the next morning that the pain had entirely disappeared. On account of the degree of manipulation as a precautionary measure, opium suppositories were used for three days subsequently. During the second twenty-four hours there were marked uterine pains. The patient made an afebrile, post-operative recovery, without aborting.

Chianello: Effects of Sympathectomy of the Hypogastric Artery on the Female Internal Genitalia. Arch. Ital. di Chir. 24: 365, 1929.

The author thus sums up his results: In bitches perihypogastric sympathectomy has shown a distinct beneficial influence on the development of the ovary with large augmentation and earlier maturation of the follicle. The influence on the trophism of the uterine cornu was less evident. Muscle tissue did not present any difference in the two sides, but the mucosa on the operated side was distinctly thickened and contained a greater amount of glandular tissue. In most experiments no appreciable augmentation of the caliber of blood vessels was noted.

It will be important later on to compare these results with those obtained with the resection of the presacral plexus (experiments now under way).

The results so far obtained lead the author to think that perihypogastric arterial sympathectomy might have beneficial effects in cases of retardation or cessation of the development of the internal female genitalia, and in cases of precocious senescence.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

OBSERVATIONS IN THE USE OF LUGOL'S SOLUTION IN HYPEREMESIS GRAVIDARUM*

By FREDERICK H. FALLS, M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology, University of Illinois, College of Medicine)

THE etiology of hyperemesis gravidarum still remains one of the mysteries of obstetrics. Notwithstanding the voluminous literature bearing on the subject and numerous forms of treatment that have been devised, we still find serious disability and even death occurring in connection with this condition.

The relationship between the ordinary morning sickness and hyperemesis gravidarum of the pernicious type, has not been clearly defined and the part played by reflex irritation and mental and emotional states, is also a matter of dispute. One hesitates, therefore, to suggest another factor, which we believe to be active in certain of these cases and which has been mentioned previously by myself and others, namely, hyperthyroidism. However, we feel that certain observations which we have made, should be recorded for what they are worth.

The background for this investigation was laid more especially by two cases which were on my service at the University of Iowa. I will briefly relate their salient features.

CASE 1.—A primipara, white, married, twenty-six years of age, who before her marriage was in the Medical Department of the University of Iowa as a laboratory worker and, therefore, had a better understanding and could and did cooperate more satisfactorily than the average patient. She became nauseated in the sixth week of her pregnancy and after about two weeks put herself under the care of a local physician; she was put to bed on a restricted diet for two weeks and then referred to the University of Iowa clinic where she was under observation for another week under intensive treatment for hyperemesis including rectal and subcutaneous use of glucose solution, with bromides, alcohol, sodium bicarbonate, etc. Her condition improved slightly for three or four days when she became worse again even under strict management. It was then decided to empty her uterus.

Twin fetuses of about three to four months' development were delivered by abdominal hysterotomy under ethylene oxygen anesthesia. The patient was returned to bed in good condition but the pulse remained high. Her general condition grew gradually weaker although the vomiting stopped, and she took considerable fluid and food by mouth. She appeared toxic and the pulse gradually became more rapid and thready. She died on the twenty-ninth day after operation. A complete post-mortem examination failed to reveal the cause of death. The liver did not show the typical changes said to be characteristic of hyperemesis, and the kidneys were normal.

CASE 2.—A colored woman, para ii, married, twenty-eight years of age, entered the hospital about a week after she missed her menstrual period and began to

*Read before the Chicago Gynecological Society, January 16, 1931.

notice some nausea. In her previous pregnancy she had come to the hospital a few weeks after nausea had started. She exhibited intense vomiting and considerable emaciation with a very rapid pulse. She was put to bed and failing to improve, the uterus was emptied. The nausea stopped and she made an uneventful recovery. She was asked to report immediately after she had missed a period if she became pregnant again.

On her second admission she was immediately put on intensive treatment. The vomiting was almost completely controlled so that she was allowed to partake of a rather generous diet. There was some nausea but very little vomiting and her general condition remained good. About the end of the second month of her pregnancy, her pulse became rapid, 100 to 120 and she exhibited some nervous symptoms. These gradually became aggravated and she complained of double vision. One evening the nurse found her out of bed, wandering around the ward and not clear in her mind as to how she got there or what she was trying to do. Her pulse was then 124. Remembering Pinard's old dictum that a pulse running over 100 any length of time, calls for abortion; it was decided that if the pulse went to 130, we would terminate the pregnancy. At two o'clock in the afternoon the Resident reported her pulse 130. By 3:30 o'clock and before the operation was started, the pulse had risen to 180. A vaginal hysterotomy under light ethylene anesthesia was done in twenty minutes. At the end of the operation her pulse was 208 and was uncountable at the wrist. She was returned to bed and given hypodermoclysis after which her pulse dropped to 160 but rose again to 208 the next day and she died that evening. A complete postmortem examination failed to reveal the cause of the death in this case.

The causes of these deaths have always been baffling to me. There was nothing tangible clinically except the rapid pulse and the presence of a toxic neuritis for which no cause could be elicited. Inanition was surely not the reason. The liver did not show sufficient change microscopically to account for death. Unfortunately the thyroids were not studied microscopically in these cases. In the first case altered metabolism due to the fetuses and placenta could hardly have been the source of the toxemia since she lived nearly a month after delivery. This type of case is, of course, well known and hence the advice of Williams and others to abort the toxic cases that do not respond to treatment.

Carl Davis found that in a series of apparently normal pregnant women there were a number that had a relatively high basal metabolic rate. He also noted that these patients were apparently benefited by the continuous administration of small doses of Lugol's solution.

Two years ago we reported a series including normal pregnant women, women showing mild toxic symptoms of hyperthyroidism and women showing toxic adenoma and exophthalmic goiters. Two of the latter showed marked hyperemesis and recovered under Lugol's solution.

The beneficial effect of Lugol's solution in cases of toxic goiter is well known both to surgeons and medical men. The current surgical opinion is that it should be used only as a preoperative measure. If, in a given case, operative intervention is not undertaken, a relapse will surely occur even while the Lugol solution is being taken and the

safe time for operation will be missed. Surgeons believe, therefore, that Lugol's solution cannot be used over a prolonged period of time in the management of toxic goiter patients. Likewise some of them find that certain patients with toxic goiters, especially those classified by Plummer³ as toxic adenomas, do not improve under the administration of Lugol's solution but may actually have their symptoms aggravated.

We have found that there are a considerable number of pregnant women who exhibit mild degrees of hyperthyroidism as evidenced by increased basal metabolic rate, increased pulse rate, unstable nervous equilibrium and heat intolerance. Not all patients exhibiting evidence of hyperthyroidism have a concomitant hyperemesis gravidarum. We have seen several, however, exhibiting extreme degrees of these symptoms that have had severe vomiting as a concomitant feature of their disease and some that have been admitted to our wards from our Out-patient Department with the diagnosis of hyperemesis gravidarum. In addition to these we have had patients treated by well qualified obstetricians in other hospitals unsuccessfully for hyperemesis, who have been referred to our service. These patients have responded to the use of Lugol's solution given in the ordinary dosage used by surgeons and medical men in the treatment of toxic goiters. The following cases are presented as illustrative examples.

CASE 1.—P. M., a white woman thirty-seven years old, housewife, para viii. She entered the Research Hospital June 28, 1929, complaining of nervousness for nine months. She had lost 15 pounds in weight in three months. She perspires easily and feels hot flashes for three weeks. She was perfectly well until the onset of this pregnancy when she began to vomit and lost 15 pounds in three months. Her appetite has been good and there has been nothing else of significance in her history.

The significant findings in the physical examination were a moderate exophthalmus, enlarged thyroid (both lobes and the isthmus). Her heart showed no murmurs, thrills, or shock. Pulse rate 120. The uterus was found to be in first degree retroversion and about three months' pregnant.

The blood and urine examinations were essentially negative. She was kept under observation for study for two months. Lugol's solution (in 10 drop doses) was given three times a day throughout her stay in the hospital. The nausea and vomiting stopped promptly. She was discharged Aug. 28, 1929.

The patient was readmitted October 8, 1929, with marked nervousness, nausea, and vomiting, rapid pulse and weakness for the past two weeks. She had not been taking the Lugol's solution regularly since the previous discharge from the hospital. She was put to bed, Lugol's solution given in the same dosage, and nausea and vomiting stopped.

Two months after delivery a lobectomy was performed. A typical histologic picture of exophthalmic goiter was found in the gland. Three months later she became pregnant again and is now within a few months of delivery. She had considerable nausea and vomiting during the first four months of this pregnancy with heat intolerance, nervousness, tremor, exophthalmus and other evidences of toxic thyroid activity even with a small amount of gland present. The basal rates at first were 2-plus and 4-plus. These have gradually risen as the pregnancy has

advanced. Patient still complains of nausea and vomiting but not to an extensive degree. She has not been given Lugol's solution during this pregnancy. She has not had to come to the hospital and has been doing her own housework.

CASE 2.—L. F. A twenty-two-year-old colored girl who was well until the second week in December, 1927, when she became constantly nauseated. Her last menstrual period was the second week in November. She was able to work until January 1. During the second week in January she began to vomit. The first few days only after food taking, later she vomited constantly until admission into the Research Hospital, February 10, 1927. She has noticed marked nervousness, cannot sit still, irritable and slight noises made her jump. She has vertigo and black spots before her eyes, relieved by lying down. She complained of palpitation. Her normal weight was 171 pounds which is now reduced to 129. Her pulse on entry was 140. Blood pressure is 120 over 52. Significant findings in the physical examination were as follows: Eyes: moderate exophthalmus, slight lid lag, Möbius and Van Graeffe signs present, and moderate internal discoloration of the sclera. The lips were dry and cracked and the tongue dry and coated and showed a slight fine tremor. The thyroid gland was moderately enlarged, bilaterally, uniformly firm and the isthmus thickened. Heart was essentially normal, action irregular, pulse thready. Abdomen was moderately scaphoid. Liver, kidney, and spleen not palpable. Liver dullness not decreased. Uterus raised to halfway between the symphysis and the umbilicus. Genitals, extremities, reflexes and skin essentially normal.

CASE 3.—G. Y. The patient entered the Obstetric Department of the University of Illinois, Sept. 15, 1927. She was a colored primipara, thirty years old, married, and a factory worker. Her last regular menstruation was April 13, 1927, but she flowed for three days beginning May 10, 1927. The latter part of June she began to vomit, at first only once a day, later frequently. She had to stop work July 11 because of weakness. About August 1 she became extremely nervous and developed a marked tremor. For a month before entry she vomited day and night. Food stimulated vomiting and it was frequently preceded by hiccough. Her past medical and surgical history were practically negative. Her menses began at eleven years, were regular, thirty-day type.

Physical examination revealed a poorly nourished woman whose present weight of 107 pounds contrasted with her normal weight of 146 pounds. Pulse 140, respiration 32, and temperature 98.6°. Systolic blood pressure was 108, diastolic 52. Neck showed moderate enlargement of the thyroid which was firm and not nodular and the pulsations of the vessels of the neck were marked. There was a moderate degree of exophthalmus. The apex impulse was not strong with a slight suggestion of a thrill. There was a systolic murmur transmitted to the axilla. The uterus was enlarged to about the size of a six months' pregnancy. Reflexes were slightly exaggerated. Vaginal examination revealed no abnormalities. The patient appeared to be extremely toxic and exhausted and was hardly able to stand. The basal rate two days after admission was plus 49. She was seen in consultation with Dr. Seed of the Surgical Department who advised Lugol's solution and was in favor of a thyroidectomy as soon as the crisis symptoms subsided. He feared that improvement, if it occurred, would only be temporary and that operation should be done before a relapse occurred. We pointed out the danger of abortion which he admitted but felt that it was slight in comparison to that of another thyroid crisis. The vomiting stopped promptly with bed rest and Lugol's solution and the basal rate remained above normal though greatly reduced. She continued on Lugol's solution from September 19 until November 4 and after a rest of a few days it was commenced again and was again discontinued on December 19 for five days. It was then continued until her delivery. An x-ray

taken of her chest was negative for tuberculosis. A film made on Sept. 16, 1927, showed a single fetus; another taken Jan. 3, 1928, showed two babies.

The red blood count was 4,650,000, leucocytes 13,600. Her general condition was so good on conservative management that we decided to defer operation until some further evidence of thyroid toxemia presented itself. We found that the basal rate continued slightly above normal, that the pregnancy apparently developed normally and that the patient's general condition and nutrition continually improved. She had very little reserve strength, however, as evidenced by her weakness in attempting to get out of bed on several occasions. The iodine solution was stopped twice for a period of a few days and this was followed each time by an aggravation of the nervous symptoms, although the vomiting did not return. We kept her under this management and in bed most of the time until February.

Following delivery her basal metabolic rate dropped to plus 10 and she was discharged from the hospital. Six months later the basal rate was plus 40 but no other evidence of hyperthyroidism. She was referred to Dr. Seed who advised against operation.

Patient became pregnant again January 19, 1929; she was treated in the Out-Patient Department with Lugol's solution. Her basal rate remained only slightly above normal; she had no vomiting and was able to do her own work and take care of her baby until she went into labor when she entered the hospital.

CASE 4.—L. R. entered the hospital Sept. 20, 1930. Para iii, colored. First pregnancy January 21, 1927. Had excessive vomiting. Second pregnancy July 29, 1928. Was very nauseated. At term, April 21, 1929. Urine showed marked acetone reaction. Everything was stopped by mouth and she was given 1,000 c.c. of 5 per cent glucose in saline, hypodermatically. There was marked salivation. On September 21 she was given 10 minims of Lugol solution in 10 c.c. of saline intramuscularly. On September 22, R.B.C. 5,000,000, pulse 99, W.B.C. 8,500, temperature 90, and hemoglobin, 65 per cent. September 23 she was given 5 per cent glucose in saline plus 10 minims lugol by hypodermoclysis, 1,600 c.c. September 24 she was given hypodermoclysis 1,000 c.c. 5 per cent glucose with 10 minus Lugol. September 26 no vomiting, taking fluids, toast and jelly. Wassermann and Kahn tests were negative. Urine showed a trace of albumin, 4-plus acetone and 4-plus diacetic acid.

On admission she was given 1,000 c.c. of glucose and 60 grains of sodium bromide hypodermically and no food or water by mouth. On the second day, proctoclysis containing glucose, alcohol, soda bicarbonate, and sodium bromide was started. She had frequent short attacks of hiccough. The basal rate was found to be 109 plus. On the third day she was given 45 mm. of Lugol's solution in the proctoclysis solution and some tea and water by mouth, which she retained. On the fourth day she was taking full liquid diet and crackers and jelly and Lugol's 90 drops a day in proctoclysis.

On the fifth day she was continued on Lugol's solution by mouth and taking soft diet. Her pulse was 64; she was sleeping well and feeling fine, urine free of acetone and diacetic acid.

On the sixth day a basal rate showed plus 12 and pulse of 88. She was allowed up and about on the eighth day and sent home on the ninth day still on Lugol's solution.

During the intervening two years the patient was perfectly well. With the beginning of this pregnancy, the patient began vomiting. During the second month, the patient was admitted to a hospital in the city in a condition of collapse from persistent vomiting. Routine medical and dietary treatment was given her over a period of two weeks with very little improvement. The family then

transferred her to our hospital. On admission the patient was extremely dehydrated, emaciated and acidotic. She was hyperirritable, showed a fine tremor, moderate exophthalmus, small soft goiter and her pulse was 110 to 140. She received regular medical and dietary treatment similar to what she had been receiving in the other hospital but in addition Lugol's solution, amounting to about 40 minims daily, first per rectum, later by mouth. Within a week there was a marked improvement and the patient was able to return to her home feeling entirely well at the end of three weeks, having gained seven pounds, able to eat anything, pulse down to 80, very little tremor, no symptoms. The patient failed to return to our clinic but was delivered in another hospital at term and records there show an uneventful prenatal record after dismissal from our hospital and a normal delivery. ?? ??? taken ten days after delivery of her first baby, two years ago, was plus 10.

CASE 5.—Mrs. B., para iii, aged twenty-four, entered the Augustana Hospital with a history of vomiting (severe) for six weeks. The last two weeks she had been in another hospital under intensive treatment for hyperemesis gravidarum including proctoclysis, with glucose solution hypodermatically. She was very much emaciated. Pulse 168. Thyroid palpable, slight exophthalmus. She was given Lugol's solution with 5 per cent glucose solution under the skin. Her condition improved and proctoclysis of 1,000 c.c. containing 5 per cent alcohol, 3 per cent sodium bicarbonate and 60 grains sodium bromides. To this was added 45 minims of Lugol's solution. After two days of this régime small amounts of milk and tea were given. She went on to uneventful recovery and delivery. She became pregnant again about six months afterward. Vomiting started as before and fearing that she would have a repetition of the serious distress, she came in requesting that she be aborted. We prevailed upon her to try the Lugol's solution as used previously which she did and the vomiting promptly stopped and she continued to date without any recurrence.

As a result of the experience with these cases, our routine management for severe cases of hyperemesis gravidarum has become the following:

As soon as the patient presents herself to the clinic all food and fluid per mouth is stopped for twenty-four hours; she is given proctoclysis of the following solution:

Glucose	50 gm.
Alcohol	50 c.c.
Sodium bromide	4 gm.
Sodium bicarbonate	30 gm.
Lugol's solution	45 mm.
Normal saline solution to make up	1,000 c.c.

If the patient shows evidence of alkalosis the sodium bicarbonate may be omitted from the proctoclysis. This quantity is divided into three doses.

The patient is given a cleansing enema at 7 A.M. At 9 o'clock the first 330 c.c. of the solution is run into the bowel at the rate of 40 drops a minute; it is usually taken by 11 o'clock. The second dose is given at 1 P.M., the third dose about 6 P.M. In addition the patient is given 1,600 to 2,000 c.c. of 5 per cent glucose solution hypodermatically with 20-30 mm. of Lugol's solution. This may be repeated the following day and if the subcutaneous administration is too distressing to the patient, intravenous administration can be used. In this event we cut down the Lugol's solution to 10 or 15 mm. After twenty-four hours we start the patient on $\frac{1}{2}$ ounce of water every one-half hour and as soon as this is re-

tained, we substitute milk, tea, and orange juice. To each ounce of the latter we add 1 drop of Lugol's solution so that the patient receives about 30 drops by mouth per day. As soon as the fluid intake tolerated by mouth exceeds the output we discontinue the hypodermic and rectal injections and substitute small amounts of solid food until the patient is taking a full diet.

We have not had a death from hyperemesis gravidarum nor have we had to empty a uterus for this indication since we have adopted the foregoing method of treatment. The preceding five years with practically the same treatment (with the exception of Lugol's solution), we lost three patients and were forced to abort three others.

In addition to these severe toxic cases we have tried the effect of Lugol's solution in the ordinary mild nausea and vomiting of pregnancy with, on the whole, not very satisfactory results. In most cases the patients complain that taking the drug even in milk or tea or orange juice, the taste nauseates them. However, several patients who have had rather severe and prolonged vomiting in previous pregnancies and were, therefore, ready to give the Lugol's solution a real trial, even at the expense of some discomfort, have reported much improvement. I have had them stop the drug from time to time and nausea and vomiting recurred. Whether the psychic effect caused a recurrence of the vomiting or not, I cannot say. Recently I have been using potassium iodide (saturated solution) in 10 drop doses as a substitute for Lugol's solution and find it much easier for the patient to take.

It has occurred to me in this connection that in these women who seem to benefit so greatly, we may be dealing with a mild type of the true toxic vomiting on a thyroid basis, which responds to Lugol's solution, while in the neurotic type of pernicious vomiting, the iodine would not give results and therefore would not be acceptable to the patient.

There are in all probability as have been emphasized by Williams and others, only two forms of true vomiting of pregnancy, neurotic and toxemic. It would seem from a study of our material that some at least of the true toxemic types, had an associated hyperthyroidism which conceivably may be the underlying factor in the toxemia since treatment by Lugol's solution controlled the toxemia and resultant symptoms.

There are two points that we desire to emphasize in connection with this presentation, namely, what we know and what we surmise. The latter group comprise far the greater amount of our material. What we know resolves itself into the following facts.

1. Pregnancy is usually associated with stimulation and in most cases hypertrophy and hyperactivity of the thyroid gland, both of which are measurable.

2. The reproductive function is under the direct control of the glands of internal secretion and the sympathetic system.

3. Disturbances of thyroid function leading to the clinical picture of toxic goiter are frequently associated with marked disturbances of the gastrointestinal tract, such as vomiting and diarrhea, together with emaciation, heat intolerance, and rapid pulse. Certain patients who have died with the clinical picture of hyperemesis gravidarum, have presented a similar picture to that of thyrotoxicosis.

4. Some patients presenting the clinical picture of hyperemesis gravidarum, have been found upon careful investigation to have definite evidence of toxic goiter and treatment of the latter condition by Lugol's solution resulted in the cure of the hyperemesis.

5. Patients who have been desperately sick with hyperemesis gravidarum in one pregnancy, have been prevented from developing the condition in the second pregnancy by administration of Lugol's solution in 10 drop doses three times a day.

6. All cases that we have studied and that have had symptoms of toxic goiter complicating pregnancy, have had rather marked vomiting for two or three months during the early pregnancy and most of them have had the condition last until the fifth or sixth month or even throughout the pregnancy.

Those points that we are uncertain about but that we surmise to be true are:

1. There is a connection between the ordinary morning nausea and the activity of the thyroid in most cases.

2. That this may be benefited by the administration of iodine in some form even if Lugol's solution is not tolerated.

3. That the ordinary vomiting may reduce the necessary intake of iodine in the food at the same time the pregnancy makes greater demands on the thyroid for iodine. Thus is produced a vicious cycle. The thyroid is stimulated to produce a toxic secretion. This irritates the sympathetic nervous system and produces more vomiting. This can only be broken by supplying the iodine by other means than the food until the intoxication has been sufficiently reduced to allow the body to take it in again in the food.

4. Severe intoxication due to the continuance of the condition to the stage of marked emaciation and probable damage to the nervous systems (both central and sympathetic) will result in death even when the original exciting cause, the pregnancy, has been terminated.

5. The beneficial effects that most observers have noted from the use of large amounts of glucose, may be explained on the assumption that it protects the body proteins and fats that would otherwise be broken down by the extreme activity of the metabolism in hyperemesis gravidarum secondary to the hyperthyroidism.

CONCLUSIONS

1. The cause of hyperemesis gravidarum is unknown.
2. Certain cases of pregnancy with hyperemesis present evidences of hyperthyroidism and are benefited by the treatment for the latter condition.
3. Lugol's solution administered orally, intravenously, or intramuscularly apparently has been of value both as a prophylactic and as a curative remedy.
4. In our rather small series of patients some of whom were quite sick when first seen, we have not had to resort to abortion since we have been using Lugol's solution in the manner described.

REFERENCES

Davis, Carl H.: J. A. M. A. 87: 1004, 1926. *Falls, F. H.:* AM. J. OBST. & GYNEC. 17: 536, 1929. *Mussey and Plummer:* J. A. M. A. 87: 1009, 1926.

(For discussion, see page 949.)

FETAL MORTALITY*

A STUDY OF 225 CONSECUTIVE FETAL DEATHS IN A SERIES OF 4,668 DELIVERIES

BY ROBERT M. GRIER, B.S., M.D., EVANSTON, ILL.

NO ANALYSIS of the fetal mortality at the Evanston Hospital having been made in the past six years, it was hoped that through a careful study we might learn the result of our work and in so doing perhaps prevent the loss of some babies. The records of all the deliveries resulting in stillbirths or neonatal deaths during the years 1923 to 1928 inclusive were studied. In the State of Illinois Vital Statistics Reports, all babies of five months' gestation or over are considered viable and so are likewise included here.

In the six years mentioned there have been 4,668 deliveries. The total fetal mortality was 225, or 4.8 per cent. An analysis of the incidence of abortions previously reported in the private practices of Dr. Danforth and Dr. Galloway showed that one out of nine pregnant women aborted, or 11.1 per cent. There is no way of telling whether this is a fair figure for the community. Probably it is not, for who knows how many go directly to some one who will do a criminal abortion. According to the reports of Whitthouse, one of every 4.7 pregnancies is aborted either spontaneously or criminally. However, should we merely assume the figures 11.1 per cent to be correct, and to these we add the 4.8 per cent of this series, it is startling to think that nearly 16 per cent of pregnancies result in disaster for the infant.

*Read at a meeting of the Chicago Gynecological Society, January 16, 1931.

This means that any woman who comes to our hands for confinement can be offered only an 84 per cent chance of a living baby.

No attempt was made to analyze the abortions, but we did try to find out why so many viable babies were lost. In general the age and parity of the mothers whose babies did not live showed us nothing, as is seen in Table I. There is perhaps a larger number among primiparae, though it is slight.

TABLE I. MOTHERS' AGES. AVERAGE AGE OF 221 OF 225 PATIENTS—29.5 YEARS

PARA	NO. OF PATIENTS	AVERAGE AGE
I	105	27.2
II	59	29.1
III	29	30.8
IV	12	33.8
V	6	36.3
VI	2	35.0
VII	3	34.5
VIII	2	40.5
IX	3	40.0
Not given	4	
Total	225	

Quite a large number of the fetal deaths were in premature labors, as can be seen in Table II. Though in late years we have been saving more of these babies, still any babe of less than eight months' gestation or less than four pounds in weight does not give a very good prognosis in anyone's hands. However, in our figures in later tables

TABLE II. MONTHS OF GESTATION

MONTHS	NUMBER	PER CENT
5-6	43	
6½	8	51
7	27	
7½	18	
8	31	174
8½	18	77.4
9	67	
9-10 days	13	
Total	225	

we have assumed any babe of less than seven and one-half months' gestation as too premature to have a fair chance. Of these there were 96, or 42.6 per cent.

The onset of labor was considered and is shown in Table III. Here it will be seen that 155 or 68.8 per cent started labor spontaneously,

TABLE III. ONSET OF LABOR

	NUMBER	PER CENT
Spontaneous	156	68.8
Castor oil, quinine, pituitrin	24	10.8
Bag induction	34	15.1
Hysterotomy or section	12	5.3
Total	225	100.0

whereas 10.8 per cent were induced by modified Watson's method. Bag inductions were used in 34, or 15.1 per cent; hysterotomy or cesarean section was done on 5.3 per cent. This is a large number of inductions, but we cannot blame it entirely for the fetal deaths, as induction was usually resorted to because of pathology present which necessitated delivery without delay.

A large group of the mothers of these babies had pathologic lesions which were wholly or in part the cause of the mortality. Table IV shows four major groups. The entire number who had some lesion which might have been influential in the death of these infants was 36.9 per cent. The largest single group, it will be seen, was the toxemia group, 40.9 per cent of those with pathology.

TABLE IV. MATERNAL PATHOLOGY. MOTHERS OF THE 225 FETAL DEATHS
NO PATHOLOGY NOTED IN 142 OR 63.1 PER CENT OF 225
PATHOLOGY PRESENT IN 83 OR 36.9 PER CENT OF 225

	TOTAL	PER CENT OF 225	PER CENT OF 83 WITH PATHOLOGY
Toxemia group	34	15.1	40.9
Placental pathology group	27	11.9	32.5
Uterine abnormality group	6	2.6	7.3
Extraneous pathology group	16	7.1	19.3
Totals	83	36.7	100.0

In Table V a further classification was made of the toxemia group. Toxemia of pregnancy, with its hypertension, has been held responsible for the apoplexia of ablatio placentae. These two conditions were associated in three cases. They might have been included in the placental group, but were placed here to illustrate this point. Polyhydramnios was also found associated with toxemia four times.

TABLE V. TOXEMIA GROUP

Toxemia	26
Toxemia, ablatio placentae	3
Toxemia, polyhydramnios	2
Nephritis, polyhydramnios	2
Toxemia, myocarditis	1
Total	34

Our method of treating toxemia of pregnancy is largely prophylactic. The maternal gain in weight is closely watched, an increase of more than twenty to twenty-five pounds being considered excessive. We believe that this throws an unnecessary load on the kidneys which may overflow the threshold of kidney function. With a rise in blood pressure over 140, or albuminuria we institute bed rest, a low protein diet and a large amount of fluids (2,000-3,000 c.c. daily). If these methods fail, and if the toxemia becomes manifestly of the preeclampsia

tic type, we induce labor by a modified Watson's method, bag, or do a low cervical cesarean section under local infiltration anesthesia. Should true eclampsia develop, we follow Stroganoff's method until the toxemia is sufficiently improved to warrant attempt at delivery by any of the above named methods. Needless to say, many of these babies were delivered prematurely. Prematurity plus maternal toxemia affords a poor chance of a living baby. Even at term when the mother has had a severe toxemia, the infant seems to have much less resistance. The mother is given first consideration and often the life of the baby is disregarded in her treatment. However, we always try to carry a woman to term if possible.

TABLE VI. PLACENTAL PATHOLOGY GROUP

Placenta previa	13
Ablatio placentae	2
Polyhydramnios	4
Placenta previa, polyhydramnios	1
Placenta previa, prolapsed cord	1
Ablatio placentae, polyhydramnios	1
Habitual abortion	2
Vaginal bleeding	3
(Ablatio toxemia, 3)	—
Total	27

Some placental pathology has been present in 11.9 per cent of the mothers of the 225 fetal deaths. Table VI shows the frequency of the various forms of placental pathology. Strictly speaking, the placenta and membranes are part of the ovum, but the association of the uterus

TABLE VII. UTERINE ABNORMALITIES GROUP

Uterine fibroid	1
Uterine fibroid, pyelitis	1
Uterine suspension	1
Uterine septum	1
Retroversion	1
Two previous sections	1
Total	6

TABLE VIII. ACCIDENTAL OR EXTRANEOUS PATHOLOGY

Pyelitis	6
(Pyelitis myomas, 1)	
Pneumonia	1
Pneumonia, myocarditis	1
Mitral stenosis	1
Severe anemia	1
Intestinal obstruction	1
Twisted ovarian cyst	1
Cholecystitis, hypertension	1
Tape worm	1
Duodenal ulcer	1
Acute pancreatitis, cholelithiasis appendicitis, toxemia	1
Total	16

and these parts is so close, and the infant is so distinctly separate from them, that placental pathology has been considered maternal. Placenta previa is the commonest, occurring in 15 of 27 cases. Three more were diagnosed as ablatio placentae and three others were listed with the toxemias. Polyhydramnios alone was present four times, and three of these were delivered of monsters. One case of placenta previa and one of ablatio placentae also had polyhydramnios, as did two cases of toxemia, and two of nephritis. The latter two associations may be of significance, as some writers believe that toxemia arises from a lesion of the placenta. Two cases of habitual abortion were entered in this group, perhaps arbitrarily, although many abortions are due to placental pathology, such as placenta previa, ablatio placenta, and polyhydramnios. In three instances babies died when no other pathology was noted than vaginal bleeding. To what extent bleeding occurred could not be ascertained. Probably these were cases of marginal placenta previa. The two remaining major groups could not be held as greatly contributory to fetal mortality, but in some instances they could. For example, pneumonia, pneumonia with myocarditis and pyelitis often cause premature births due to the fever and toxicity.

A study of the type of delivery in these 225 deaths was very interesting. So often one accuses the accoucheur of the death of an infant before the circumstances are known. The total mortality of infants was 225 in 4,668 deliveries. This is a gross mortality of 4.82 per cent. In Tables IX to XV showing the types of deliveries, both the gross and corrected mortality percentage is given. The corrected mortality means total fetal mortality less those under seven and one-half months. This, then, brings the figure for all types of deliveries, both spontaneous and operative, when corrected, to 3.19 per cent.

TABLE IX. GENERAL TABLE. FETAL MORTALITIES IN RELATION TO TYPES OF DELIVERY

TOTAL DELIVERIES, SPONTANEOUS AND OPERATIVE, 4668	NUMBER	PER CENT
Total mortality	225	4.82
Corrected mortality*	149	3.19
Total spontaneous deliveries, 3,100 = 66.4 per cent		
Total mortality	108	3.5
Corrected mortality*	60	2.0
Total operative deliveries, 1,568 = 33.6 per cent		
Total mortality	117	7.4
Corrected mortality*	89	5.6

*Corrected mortality means total mortality less those under seven and one-half months.

If we consider just the 3,100 spontaneous deliveries which were 66.4 per cent of the 4,668, then the total fetal mortality is 3.5 per cent, and the corrected 2.2 per cent. These figures, compared with the results of all the operative deliveries, which comprise 33.6 per cent of the

total are very striking. Here the total mortality was 7.4 per cent, and the corrected 5.2 per cent. One would naturally expect the mortality to be higher for the infant in operative deliveries. However, not all types of interference are harmful as is seen in the case of low forceps deliveries, where results were even better than after spontaneous deliveries.

Low forceps comprise 19 per cent of all types of deliveries, but the fetal mortality was only grossly 2.2 per cent, and the corrected 1.7 per cent. This certainly speaks strongly in favor of the prophylactic forceps which, in the hands of trained obstetricians, is a procedure of choice rather than one to be avoided. We have felt for some time that it carries much less risk for the baby than to allow prolonged trauma to the head without progress. It has been a policy of this department not to let a woman continue in labor for a long period of time after the head has reached the perineum. There is no time limit set, but in general a head should not be allowed to "pound" against the perineum for more than one hour. This does not mean that the second stage cannot be longer. After full dilatation it may be necessary for rotation and molding to take place. This frequently takes from two to three hours. It is doubtful whether much is to be gained in allowing labor to progress longer at this stage.

There were nine fetal deaths following midforceps deliveries, both gross and corrected mortality being the same, 5.1 per cent. The incidence of midforceps was 3.7 per cent for the six years, but has been growing less each year. It is not always possible to wait until the fetal head has reached the low plane, but with more conservative obstetrics being followed, this number will gradually be reduced to a minimum. So frequently with the head in the mid plane, forceps are improperly applied to the head. If manual rotation is intelligently performed, many babies can be saved.

TABLE X. FETAL MORTALITY. FORCEPS DELIVERIES

TOTAL FORCEPS DELIVERIES, 1,122 = 24.0 PER CENT		NUMBER	PER CENT
Total mortality		35	3.1
Corrected mortality		30	2.6
Total low forceps, 921 = 19.9 per cent			
Total mortality		21	2.2
Corrected mortality		16	1.7
Total midforceps, 174 = 3.7 per cent			
Total mortality		9	5.1
Corrected mortality		9	5.1
Total high forceps, 27 = 0.5 per cent			
Total mortality		5	18.5
Corrected mortality		5	18.5

High forceps is a method of delivery we avoid as much as possible because of the consequent fetal mortality and morbidity. The operation was done only 27 times, an incidence of 0.5 per cent. The fetal

mortality was 18.5 per cent for both gross and corrected figures. In the past few years it has been done even less often; in 1929 only twice, and in 1928 not at all. Perhaps we are keener in recognizing fetal disproportion. At any rate, the number of men with courtesy privileges who have not had adequate training is greatly reduced. Today our method of choice, when the head does not engage after a test of labor, is the low cervical cesarean section. If on admission the baby's head is not engaged, the woman is treated as a potential candidate for cesarean section. Vaginal manipulation is avoided until dilatation is complete. If then the membranes are still intact, these are ruptured after instilling 4 per cent mercurochrome into the vagina with a Mayes' syringe. Labor is then allowed to continue for one hour with the mother working. Should engagement not follow, low cervical cesarean section may be done with safety, it being considered that the woman has then had a good test of labor.

There were 177 breech presentations, an incidence of 3.6 per cent. Seven of these were delivered by cesarean section and so shall not be considered in this paragraph, which deals only with spontaneous breech and breech extraction deliveries. Thus, in Table XI 170 breech deliveries are shown. The total fetal mortality was 20.0 per cent. The corrected mortality, removing only prematures less than seven and one-half months, was 12.9 per cent. However, when we take away the monsters and macerated fetuses the result is 7.0 per cent, or twelve cases. The cause of death given for these was cerebral hemorrhage in seven, craniotomy in two, a pulseless prolapsed cord on admission in two, and placenta previa in the mother in one. One of the cases where cerebral hemorrhage was found, at autopsy also had a thrombosed umbilical cord, the fetal heart tones being absent on admission. All but three of the patients where cerebral hemorrhage or craniotomy was the cause of death were multiparae. These three primiparae would have been better delivered by cesarean section. Breech presentations in primiparae when elderly or when a borderline pelvis is suspected should not be submitted to the risk of delivery from below.

Version and extraction was done in these six years 140 times. This is an incidence of just 3.0 per cent. There were 36 fetal deaths after the maneuver, which is a gross mortality of 25.7 per cent. If we subtract the unavoidable deaths, which were nine, the figure is 19.2 per cent. These nine included two macerated fetuses, three prematures, (less than seven and one-half months), two monstrosities and two babies that died in utero because of a prolapsed cord which was nearly pulseless on admission. Ten more of the fetal deaths resulted in combating placenta previa and ablatio placentae, eight times in the former and twice in the latter. Inasmuch as the life of the child is usually disregarded when a version and extraction is done for these two conditions, we might also exclude these from the remaining 27 deaths. This

would bring the mortality figure down to 17, or 12.1 per cent. Of this number the cause of death was given as cerebral hemorrhage in fourteen, and craniotomy was done on three. Version and extraction in this department is usually done as an emergency maneuver or as a last resort; as the former in cases of placenta previa, ablatio placentae, and prolapsed cord. As the latter when manual rotation and forceps have failed.

TABLE XI. FETAL MORTALITIES. BREECH AND EXTRACTION, VERSION AND EXTRACTION

TOTAL DELIVERIES, BOTH TYPES, 310 = 67 PER CENT	NUMBER	PER CENT
Total mortality	70	22.5
Corrected mortality	55	17.7
Total breech and extractions, 170 = 3.6 per cent		
Total mortality	34	20.0
Corrected mortality	22	12.9
Less monsters, macerated	12	7.0
Total version and extraction, 140 = 3.0 per cent		
Total mortality	36	25.7
Corrected mortality	33	23.5
Less monsters, macerated and pulseless cords	27	19.2
Less placenta previa and ablatio placentae	17	12.1

TABLE XII. FETAL MORTALITIES. HYSTEROTOMY AND LOW AND CLASSICAL CESAREAN SECTIONS

TOTAL SECTIONS, 130 = 2.7 PER CENT	NUMBER	PER CENT
Total mortality	6	4.6
Corrected mortality	3	2.3
Total classical sections, 41 = 0.8 per cent		
Total mortality	5	12.2
Corrected mortality	2	4.8
Total low cervical sections, 89 = 1.9 per cent		
Total mortality	1	1.1
Corrected mortality	1	1.1
Total hysterotomies, 6 = 0.1 per cent (6 months and less)		
Total mortality	6	100.0

During these years there were 130 cesarean sections performed, an incidence of 2.7 per cent. This does not count 6 hysterotomies which were done in women for various reasons, after five months' and before six months' gestation, as placenta previa and toxemia. Needless to say, these babies were all lost. Of the 130 delivered by cesarean section, 41 were done by the classical method, an incidence of 0.8 per cent, and 89 by the low cervical method, or 1.9 per cent. In the classical operations there were five fetal deaths, or 12.2 per cent. Of these five, only one was done at term, and this for abruptio placentae and toxemia; one at eight months because of an ileus in the mother; one at seven and one-half months for placenta previa; one at seven months where the cause of death was prematurity and atelectasis and the

operation was done because of a premature onset of labor and two previous sections. In the low cervical operations there was one fetal death, due to cerebral hemorrhage in a primipara with a breech presentation and a flat pelvis. Perhaps we can safely say that none of these babies died because of the method of delivery, but because of the indication for cesarean, except the one which died of cerebral hemorrhage and this is hard to explain.

Of the 225 fetal deaths in this series, 111 or 49.3 per cent were autopsied. Nearly half, or 48.6 per cent of these were premature, weighing less than 2,000 gm. Thus only about one-fourth, or 25.7 per cent, held much interest at postmortem.

TABLE XIII. AUTOPSY REPORT. 1923-1928

Total fetal mortality	225
Total number having autopsies	111
Percentage of babies autopsied	49.33
Number autopsied, weight over 2000 gm.	57
Percentage autopsied, weight over 2000 gm.	51.35

It is with this comparatively small group that we shall be chiefly concerned. In both the stillborn and neonatal deaths males predominated, though the average weight of the females was slightly more than the males, being 6.4 pounds and 6.2 pounds respectively. It is notable that in both sexes the average weight of stillbirths was more than a pound greater than that of those born alive. In the mothers of the full-term babies, 78 per cent went through normal pregnancies, and 22 per cent were abnormal in some way. The percentage of abnormal pregnancies in the premature babies was higher, 40 per cent.

An analysis of the labors shows that the number of spontaneous deliveries was about equal to the operative, being 49 per cent for the former, and 51 per cent for the latter. Of those born alive, exactly half were spontaneous and the other half operative. Almost the same prevailed for the stillbirths, there being 47 per cent spontaneous and 53 per cent operative.

From Table XIV we see that breech extraction, with or without ver-

TABLE XIV. SUMMARY OF LABORS

SPONTANEOUS	STILLBORN	NEONATAL DEATHS	TOTAL
Rapid	7	16	23
Prolonged	3	2	5
Total	10 = 47%	18 = 50%	28 = 49%
Operative:			
Version and breech extraction	11 = 53%	18 = 50%	29 = 51%
Breech and extraction	5	3	8
High forceps	2	4	6
High forceps	3	2	5
Mid forceps	0	3	3
Low forceps	0	5	5
Cesarean section	0	1	1
Craniotomy	1	0	1
Total spontaneous and operative	21 = 38%	36 = 62%	57 = 100%

sion, was responsible for 14 out of 57 deaths, or 25 per cent. All types of forceps deliveries totaled 13, or 23 per cent. But almost four times as many forceps deliveries occurred during the six years as breech extractions. It is worthy of note that only one death occurred from cesarean section in this series.

Of the 28 deaths and stillbirths after spontaneous delivery, 23 were after a rapid labor and only 3 after a prolonged labor. This is a result that has been noted before by many authors. Pituitrin is rarely used in our department, so that even in normally rapid labors one finds a much higher fetal mortality.

TABLE XV. CAUSES OF DEATH

	TOTAL	SPONTA- NEOUS	BREECH EXTRAC- TION	HIGH FORCEPS	OTHER FORCEPS	SEC- TION	CRANIO- TOMY
Cerebral hemorrhage	23 = 39%						
Traumatic	16	4	4	3	5	0	0
Spontaneous	7	4	3	0	0	0	0
Congenital atelectasis	6	3	2	0	0	1	0
Intrauterine asphyxia	5	3	1	0	1	0	0
Occlusion of cord	5	3	2	0	0	0	0
Heart conditions	5	4	0	0	1	0	0
Bronchopneumonia	3	3	0	0	0	0	0
Aerania, etc.	2	0	1	1	0	0	0
Toxemia (mother)	1	0	0	0	1	0	0
Macerated	2	1	1	0	0	0	0
Acute leptomeningitis	1	1	0	0	0	0	0
Hemorrhagic jaundice	2	1	0	1	0	0	0
Pemphigus	1	1	0	0	0	0	0
Hydrocephalus	1	0	0	0	0	0	1
Total	57	28	14	5	8	1	1

From the above we see that nearly all the deaths that we can attribute to forceps are due to traumatic cerebral hemorrhage. Deaths in breech extraction are due to cerebral hemorrhage, occlusion of the cord, atelectasis, or asphyxia. The acute meningitis occurred in a case of spina bifida with a large meningocele which became infected. Diagnoses of intranterine asphyxia were made on the basis of multiple petechial hemorrhages into the walls of the viscera, in the absence of other grave lesions. Toxemia produces similar lesions, as a great many of the babies whose mothers had a toxemia showed a greater or lesser number of these hemorrhages. The most frequent cause of the traumatic cerebral hemorrhage was a rupture of the tentorium cerebelli. This, it would seem, was due to the elongation of the head.

The heart lesions mentioned above consisted of widely patent ductus arteriosus, or foramen ovale or both with resultant dilatation of the right heart. However, some degree of patency of these was present in most of the newborns, being found in 42 of the 57 cases. Those 5 mentioned above were very widely patent, sufficient to have been thought the cause of death.

Any attempt to state a definite single cause of death is perhaps

foolish because there were numerous instances where combined lesions were the cause. For example, many of the lesions might not have been fatal or present had the baby not been premature. This is certainly a great contributory cause, especially in cases of atelectasis or asphyxia and cerebral hemorrhage. Furthermore, in full-term babies it was common to find evidences of asphyxia in many of the cerebral hemorrhage cases. Probably in many of the cases of breech extractions the infants died of asphyxia before they were delivered, in one way or another, the asphyxia causing cerebral hemorrhage.

SUMMARY

1. A gross fetal mortality of 4.82 per cent and a corrected mortality of 3.16 per cent can be reduced.

2. The fact that at least 16 per cent of women who come to us for confinement do not receive a living baby seems appalling. Actually from 20 per cent to 25 per cent would be more correct for the community if we knew of all the induced abortions.

3. There were 76 or 42 per cent of this series of deaths in which the period of gestation was seven and one-half months or less. Why so many labors begin prematurely was not determined but should be an important matter for investigation.

4. Practically 26 per cent of the mothers of these babies were induced. Of this number more than half had the colpeurynter. In most instances the latter method was used for placenta previa or toxemia. This would indicate that many of the mothers had pathology that required their immediate delivery rather than that the inductions were the cause of the deaths.

5. There was maternal pathology which was contributory to the death of the infants in 36.9 per cent. Of these 40.9 per cent were in the toxemia group and 32.5 per cent were in the placental group. Thus, of the maternal conditions that influenced somewhat the fetal mortality, 73.4 per cent had either toxemia or a premature placental separation.

6. Two-thirds of all the deliveries were spontaneous. In these the fetal mortality was grossly 3.5 per cent, whereas the corrected figure was 2.0 per cent. Comparing these figures with the results after low forceps deliveries, which comprised 19 per cent of all types, the gross mortality was 2.2 per cent, and corrected 1.7 per cent. This upholds very well the arguments in favor of the prophylactic forceps.

7. Mid forceps showed a fetal death rate of 5.1 per cent. This is but very little more than the average for all types and does not appear unusually high. Though we feel that this figure will be improved as we become more adept at manual rotation and the application of the forceps.

8. High forceps has always been a dreaded operation, and justly so because of the 18.5 per cent fetal mortality. The incidence of the

maneuver was only 0.5 per cent and is becoming even less. In the past year it was done only once.

9. Breech presentation and extraction is another procedure which has a high fetal mortality. In our hands the gross figure was 20.0 per cent, but if we subtract the prematures as before, as well as those macerated and monsters, the figure is only 7.0 per cent. Thus it would seem that in many of the breech presentations the child is either premature or abnormal in some way.

10. Version and extraction with an incidence of 3.0 per cent shows the highest mortality rate on any of the obstetric procedures, being grossly 25.7 per cent. Subtracting prematures, monsters, macerated fetuses, and those with a pulseless cord on admission, the rate is still 19.2 per cent. This does not speak well for our technic; however, in our hands it is used as a method of last resort as in cases of placenta previa, prolapsed cord, and after failure of manual rotation and forceps delivery. Other means of delivery must be possible, because since we have realized these poor results, in the past six months the procedure has been done but twice, an incidence of 0.4 per cent.

11. In a private hospital, such as the Evanston Hospital, we do not think that we have obtained enough autopsies. We should be able to do better than 49.3 per cent.

12. Only those autopsied babies weighing over 2,000 grams were studied, because any under this weight were of little interest.

13. There were then only 57 autopsies studied. In this small series a few things did stand out, namely, that:

- a. Males predominated.
- b. The average weight of females was more than that of males.
- c. The average weight of stillbirths in both sexes was more than a pound greater than that of those born alive.
- d. Those delivered spontaneously about equaled the number delivered by operation.
- e. Breech extraction, with or without version, was responsible for 25 per cent of the deaths, and all types of forceps deliveries totaled 23 per cent.
- f. Nearly all of the deaths after forceps deliveries were due to cerebral hemorrhage.
- g. Diagnoses of asphyxia were made on the basis of multiple petechial hemorrhages into the walls of the viscera in the absence of other grave lesions.
- h. Toxemia produces similar lesions.
- i. The most frequent cause of cerebral hemorrhage was a rupture of the tentorium cerebelli.
- j. Patent ductus arteriosus or foramen ovale was present in most of the newborns and is probably normal.

I wish to thank Dr. Lemuel Hussey for his admirable assistance in the latter part of this paper.

(For discussion, see page 949.)

RUPTURE OF A CORPUS LUTEUM WITH INTRAABDOMINAL HEMORRHAGE. REPORT OF THREE CASES*

By J. P. GREENHILL, B.S., M.D., F.A.C.S., CHICAGO, ILL.

THIS brief clinical report was prompted by the recent simultaneous appearance of two papers on the subject of rupture of a corpus luteum with associated symptoms, chiefly intraabdominal hemorrhage. One author, Johnson,¹ after an exhaustive study found that the total number of cases of rupture of a corpus luteum or a graafian follicle reported in the literature up to date was 77. In the second paper referred to, Mathieu and Holman² state that they were able to find reports of only 73 cases of rupture of a corpus luteum. The former author says that so far as he was able to determine no one has made the correct diagnosis before operation. The latter authors on the other hand give me the credit for having made the only correct diagnosis previous to operation. The former author includes in his series the first of the two cases of ruptured corpus luteum, the specimens of which I demonstrated before this society on two different occasions (1925, 1929^{3, 4}), whereas the latter authors cite only my second case. These facts are mentioned only to indicate the difficulties encountered in making an exhaustive survey of all the reports on a certain subject. In spite of the relatively few cases reported, all authors are agreed that rupture of a corpus luteum is much more frequent than the literature indicates.

SYMPTOMS

Since there is nothing characteristic of rupture of a corpus luteum either in the history or the physical examination, the true pathologic condition can rarely be recognized before the abdomen is opened. The diagnosis usually made is acute appendicitis, ruptured ectopic pregnancy and twisted ovarian cyst. These diagnoses are generally made because in the typical case of rupture of a corpus luteum there is sudden, violent pain which is located on the side of the involved ovary but which frequently spreads to other parts of the abdomen. In many cases the pain is referred to the umbilicus and later is localized in the right iliac fossa. Nausea and vomiting are frequent symptoms. If there is much internal bleeding the typical picture of anemia, peritoneal irritation, and shock may be present. The degree of shock and collapse is out of proportion to the amount of blood lost. In the typical case, the patient looks acutely ill, her face is flushed, and she keeps her knees elevated. The abdomen is rigid and tender, especially in the right iliac fossa. The temperature is generally elevated

*Read before the Chicago Gynecological Society, December 19, 1930.

as is also the leucocyte count. In many cases vaginal examination reveals exquisite tenderness all over the vaginal vault. There may or may not be blood in the vagina. If there is vaginal bleeding, the patient may think she is menstruating. The important thing to determine in these cases is whether or not bleeding is taking place within the peritoneal cavity. When this is decided in the affirmative the customary diagnosis made is rupture of an ectopic pregnancy. This diagnosis is correct in the majority of instances of intraabdominal hemorrhage in women but the frequency of rupture of a corpus luteum is sufficiently great to make one bear this condition in mind before making a definite diagnosis of ectopic pregnancy. The treatment is immediate operation.

CAUSE OF HEMORRHAGE

The cause of the various types of ovarian hemorrhage are outlined by Stein⁵ as follows:

- | | | |
|---------|---|---|
| Local | { | 1. Menstrual (excessive menstrual hyperemia). |
| | | 2. Nonmenstrual |
| | | (a) Active hyperemia as acute or chronic oophoritis.
(b) Passive hyperemia as thrombosis, torsion and varix.
(c) Primary and secondary neoplasms. |
| General | { | 1. Diseases altering the composition of the blood. |
| | | (a) Infectious disease, as typhoid.
(b) General disorders of nutrition as anemia.
(c) Hemophilia. |
| | | 2. Phosphorus poisoning. |
| | | 3. Burns. |
| | | 4. Venous congestion of abnormal viscera as in cardiac or pulmonary disease. |

According to Novak^{6, 7} the causes of abdominal hemorrhage arising in the ovary, a condition termed "perforative ovarian hemorrhage" by him are similar to those of ovarian hemorrhage of the nonperforative type in which the hemorrhage remains in the ovary giving rise to hematomas of varying sizes.

Novak classifies ovarian hematomas as follows:

1. Follicular { Graafian follicle
Atretic follicle
2. Corpus luteum
3. Stromal

He believes that the principal predisposing factors are conditions which bring about hyperemia of the ovary with engorgement of its vessels. The hyperemia may be either active or passive. The bleeding practically always comes from the thecal vessels of structures derived from graafian follicles. Frequently it comes from the walls of atretic follicles but even more often from the walls of corpora lutea or corpus luteum cysts. The occurrence of free bleeding from the ovary

into the abdominal cavity depends largely on the location of the follicular structure involved. If it lies near the surface, the thin wall may easily be broken through by the blood which escapes from the engorged blood vessels in its walls. Free abdominal hemorrhage thereby results.

Brakeley and Farr¹² say that in all the cases but one reported in the literature, the rupture occurred in the week preceding the onset of the menstrual period, that is from the twentieth to the twenty-fourth day of the cycle.

In some cases trauma due to coitus, attempted criminal abortion, operations, or vaginal manipulation plays a rôle. In one of my own cases for example the rupture was produced during a bimanual examination. This is similar to the case reported by Marshall.⁸ The accidental rupture of thin walled ovarian cysts during bimanual examinations is much more common than we are led to believe from the literature. When the rupture is brought about while the patient is anesthetized it may easily be overlooked. Fortunately, however, not many of these ruptured cysts lead to symptomatic intraabdominal hemorrhage.

CASE REPORTS

Since rupture of a corpus luteum with associated intraabdominal hemorrhage is uncommon, the number of such cases observed by any one gynecologist is necessarily small. Only four authors have reported three or more cases of this kind. Wilson⁹ reported five cases, Cohen¹⁰ reported six, Barolin¹¹ four and Brakeley and Farr¹² collected data concerning thirteen cases seen at the New York Hospital from 1914 to 1926 and also two private cases. I have personally operated upon three patients who had this condition.

In one of my cases I accidentally broke the corpus luteum during a bimanual examination while the patient was being anesthetized. In this case the corpus luteum was associated with an unruptured hematosalpinx on the opposite side. Novak⁵ reported a case of a ruptured corpus luteum associated with an unruptured tubal pregnancy on the opposite side and he says his is the only such case on record. He mentions that Hedde¹³ reported a case in which there was an associated tubal pregnancy on the other side of the ruptured corpus luteum, but the tubal pregnancy had likewise ruptured. Hedde quotes a similar case which was reported by Pollard.¹⁴

CASE 1.—Mrs. L. L., aged thirty-four, a tertipara, was brought to Dr. DeLee on April 24, 1925. She was told by two physicians that she had an attack of acute appendicitis and required an immediate operation. Her last menstrual period had begun on March 23. On April 19, twenty-six days after this menses she had a sudden attack of sharp abdominal pain, following which she fainted four times. It was at this time that the physicians made a diagnosis of acute appendicitis. I saw the patient with Dr. DeLee and on vaginal examination we found the following: The perineum was relaxed but there was no cystocele. There was no Chadwick sign. The cervix was long, hard, and irregularly lacerated. The body

of the uterus was normal in size, hard, anteflexed but pushed over to the left side. To the right of the uterus was a soft, doughy, very tender mass about 7 cm. in diameter, apparently adherent to the uterus. The left adnexa were negative. The entire pelvis was tender. A diagnosis of ectopic pregnancy was made, and it was decided to operate. I first made a pelvic puncture and obtained old blood. I followed this with a laparotomy and found approximately 400 c.c. of free and clotted blood in the peritoneal cavity. The left adnexa were normal but on the right side, a large clot of blood was found adherent to the ovary. When this clot was removed there was revealed a corpus luteum about 2 cm. in diameter with a rent on the surface. The blood in the peritoneal cavity had come from the laceration in this corpus luteum. The right tube was edematous and reddened. Both tube and ovary were removed on the suspicion of a possible ovarian pregnancy but microscopic sections of the ovary showed only a corpus luteum with a large tear on the surface. The corpus luteum corresponded in appearance with what is generally found in the premenstrual phase of the menstrual cycle. No sign of a pregnancy was found in the corresponding tube. Convalescence was complicated by a mild attack of bronchopneumonia but the patient left the hospital in good condition twelve days after the operation.

CASE 2.—Mrs. A. M., aged twenty-one, married four years but never pregnant, was admitted to the Cook County Hospital on November 17, 1928, because of vaginal bleeding. Her menses had always been regular and the last regular period before admission had begun September 17. On October 23, thirty-six days after this menses, she began to bleed again and this continued until November 20, the day of operation. On October 20 and 21, sharp pain had been felt in the left lower quadrant. There had been morning nausea for four weeks and itching of the breasts for two weeks. The past history was negative.

On abdominal examination, slight tenderness was elicited in the left iliac fossa. Vaginal examination revealed a nulliparous outlet, a long, hard, smooth cervix, and a slightly enlarged, hard, anteflexed and movable uterus. There were no Chadwick or Goodell signs but a suggestive Hegar sign was present. The right adnexa were slightly enlarged and tender and on the left side was a very soft, thin-walled cystic mass about 5 cm. in diameter. This ruptured as soon as it was touched. A diagnosis was made of accidental rupture of a corpus luteum cyst or ectopic pregnancy. At operation a small amount of dark blood was found in the peritoneal cavity. The left adnexa were exposed and revealed a thickened tube and a collapsed, empty, corpus luteum cyst. These were removed because there was very little normal ovarian tissue in the ovary. When the right adnexa were examined it was found that the right tube presented the typical appearance of an unruptured tubal pregnancy. This tube was also removed but the ovary was left undisturbed.

On microscopic examination, the corpus luteum cyst which was approximately 5 cm. in diameter showed hemorrhage chiefly in the wall between the outer coat and the inner wavy line of lutein cells. The tube attached to the cyst showed mild salpingitis. The right tube when sectioned showed extensive hemorrhage chiefly within the lumen. There was evidence of a number of distinct hemorrhages which had occurred at different times. The tube wall was very thin and the mucosa compressed. There was evidence of mild salpingitis, but no decidual change or sign of an ovum could be found. There may, however, have been a young ovum which reached the stage of implantation only and then degenerated or was destroyed. The interstitial portion of this tube contained numerous arteries and much hemorrhage. The diagnosis in this case was corpus luteum cyst, left, accidentally ruptured and hematosalpinx, right. The cause of the hemorrhage in the tube could not be determined unless we assume that there had been an early pregnancy in the tube. The patient made an uneventful recovery and left the hospital eleven days after operation.

CASE 3.—Mrs. M. S., aged twenty-six, a nullipara married four and one-half years, came to see me on September 28, 1928, because she believed she was having a miscarriage. Her last menstrual period had begun on August 3. On the morning of her visit, fifty-six days after her last menses, she began to bleed profusely and experienced sharp shooting pains all over the lower abdomen. While waiting in the reception room she fainted. After recovery, an examination was made. The abdomen was scaphoid and no masses were felt but there was exquisite tenderness in the left iliac fossa. Vaginal examination revealed the following:

There was a nulliparous outlet with blood in the vagina, the cervix was soft and the external os partly open. The body of the uterus was the size of a four or five weeks' pregnancy, soft, anteflexed, and movable. The right adnexa were normal but on the left side a very tender, soft mass approximately 4 cm. in diameter was felt. The diagnosis made was incomplete abortion with a corpus luteum cyst in the left ovary or left-sided ectopic pregnancy. The latter diagnosis was favored more because of the fainting spell. It was decided to operate. First the cervix which was very soft was easily dilated and a eurettement performed. A large amount of decidua-like material was obtained but nothing resembling an ovum. A pelvic puncture was then made and old blood was obtained. I then performed a laparotomy. The left tube was found to be normal but the left ovary contained a corpus luteum cyst about 3 cm. in diameter which was torn at one point and from which blood had evidently escaped. There were a few ounces of blood in the culdesac. The cyst alone was excised and the remaining portion of the ovary left in place. The right tube and ovary were normal. Convalescence was uneventful and the patient left the hospital on the twelfth day after operation.

SUMMARY

Rupture of a corpus luteum with intraabdominal hemorrhage although reported in the literature less than 80 times is much more frequent than this number indicates. Since there is nothing characteristic in either the history or the physical examination of this condition, a correct preoperative diagnosis can rarely be made. Regardless of this, the condition should be borne in mind when there are evidences of intraabdominal hemorrhage in women. The chief predisposing factors in the causation of these ruptures are the same as those which are responsible for nonperforative hemorrhages within the ovary, namely conditions which bring about hyperemia of the ovary and engorgement of its vessels. Trauma not infrequently plays a rôle. Among the author's three cases, one rupture was produced accidentally during bimanual examination.

REFERENCES

- (1) *Johnson, V. E.*: Am. J. Surg. 3: 538, 1930. (2) *Mathieu, A., and Holman, A.*: Western J. Surg. 38: 518, 1930. (3) *Greenhill, J. P.*: Surg. Gynec. Obst. 41: 529, 1925. (4) *Greenhill, J. P.*: AM. J. OBST. & GYNEC. 19: 423, 1930. (5) *Stein*: Über Hemorrhagien der Ovarien bei Schwerer Anämie, Inaug. Diss. Halle, 1908. (6) *Novak, E.*: J. A. M. A. 68: 1160, 1917. (7) *Ibid.*: Johns Hopkins Hosp. Bull. 28: 349, 1917. (8) *Marshall*: (Quoted by Novak.) (9) *Wilson, H. W.*: Lancet, 1: 1162, 1905, and 1: 1196, 1905. (10) *Cohen, F.*: Arch. f. Gynäk. 99: 505, 1913. (11) *Barolin, F. M.*: Med. Klin. 16: 9, 1920. (12) *Barkley, E., and Farr, C. F.*: Am. J. Med. Sc. 172: 580, 1926. (13) *Hedde*: Inaug. Diss. Freiburg, 1913 (quoted by Novak). (14) *Pollard*: Lancet, 1848 (quoted by Novak).

ULCERATIVE COLITIS COMPLICATING PREGNANCY AND THE PUERPERIUM*

BY CHARLES S. BARNES, A.B., M.D., AND HELEN M. HAYES, M.D.,
PHILADELPHIA, PA.

(From the Obstetrical Department of the School of Medicine of Temple University)

CHRONIC ulcerative colitis was first described as an entity by W. Hale White in 1888. But the disease received little attention, until, within the past one or two decades, it has been the subject of much intensive study. Bargen, to whom the profession is indebted for much information, began his investigations in 1923. It is variously named ulcerative, suppurative, rectocolitis gravis.

The disease may be acute, fulminating, or gradual in onset. There is a strong tendency to recurrence in apparently cured cases. It occurs far most frequently between twenty and forty years of age, not infrequently before twenty. Ulceration of the colon is the essential pathologic condition. The process usually begins in the rectum and sigmoid, but in some 80 per cent, the higher levels are finally reached, even the lower ileum. Logan,¹ in a review of 117 cases says: "Chronic ulcerative colitis is a most serious disease from the standpoint of both morbidity and mortality. It is a chronic disease of long duration ending quickly from toxemia or perforation."

As to the active infective agent or agents, investigators differ. Bargen and Logan, of The Mayo Clinic, as a result of admirable experimental research, report isolation in 45 of 60 cases of a gram-positive lancet-shaped diplostreptococcus as the exciting cause. Bargen² isolated the same diplococcus from tonsils and abscesses of teeth. Cultures introduced intravenously into animals, produced, in one-third of the number, colonic ulcers like those in man. Frequently tonsillectomy or removal of infected teeth has resulted in acute temporary exacerbations of the disease. This suggests the presence of the causative bacteria in these foci. Other earnest workers have not been able to confirm the findings of Bargen, and most authorities are disposed to designate, as the commonly exciting cause, the intestinal organisms always present in the colon, namely, the colon bacillus, staphylococcus and streptococcus. Ordinarily they are nonpathogenic to the intestine. But Kendall states, "Normal intestinal organisms may multiply with abnormal luxuriance, leading, through unusual conditions, to abnormal reactions in the alimentary canal." Among such unusual conditions Yeomans³ mentions food toxins, severe constipation, injuries, pregnancy and labor, and acute general infections. Yeomans states, also, that, generally, no definite predisposing cause can be assigned. However, in his series of 100 cases, the onset dated, in six cases, from dietary indiscretion; five, severe constipation; three, exposure; two cases each, pyorrhea and root abscesses, influenza, injury, and pregnancy. The onset followed parturition in

*Read before the Obstetrical Society of Philadelphia, February 5, 1931.

one case. He adds, "These factors are mainly significant in temporarily lowering resistance, during which the normal intestinal bacteria may assume an unusual virulence."

We present three cases of ulcerative colitis complicating pregnancy and the puerperium, a fourth one to be added in discussion.

CASE 1.—M. H., white, forty-two years old, para x. Admitted to the Temple University Hospital, July 30, 1930, at full term, well advanced in the first stage of labor.

Patient's parents both died of Bright's disease. Five living children, four dead at about two years of age. Patient was under prenatal care only the last two and a half months of pregnancy. Within this time, no serious ill symptoms were present. During the period of her prenatal care, however, she lost some four pounds in weight, her blood pressure arose from 108 systolic at first to 143/100, on



Fig. 1.

Fig. 1.—Case 1. Section of colon. Mucosa is completely destroyed. Its site is occupied by necrotic tissue, fibrin and leucocytes. Leucocytic infiltration, hyperemia and edema can be seen in the submucosa and muscle coat.

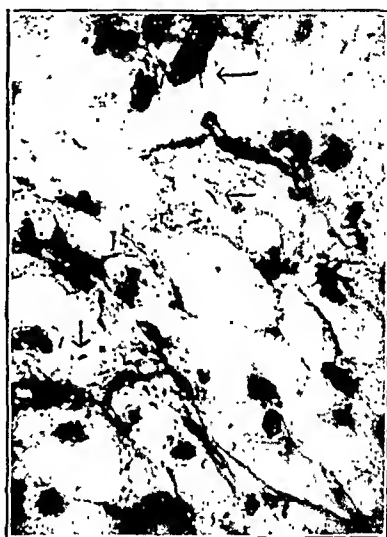


Fig. 2.

Fig. 2.—Case 1. Section of colon. $\times 1000$. In the edematous inflammatory tissue there are many bacteria. There are elongated diplococci and pseudo-diphtheria bacilli.

admission. Meanwhile, the urine showed a slight trace of albumin, but no other abnormality. A healthy child was delivered spontaneously after eight and one-half hours of labor.

Abdominal pains, at first believed to be after-pains, marked the puerperium throughout. Abdominal tenderness was soon manifest. There were very frequent, fetid stools, tympany, and great prostration. The stools were never grossly bloody. Fever, 100° on admission, soon arose to 103.6° and subsequently remained excessive of a remittent type. Note that, on admission, the maternal heart rate was 100. There was progressive heart acceleration throughout the course. A probable diagnosis of Enteritis was made. It was believed to be a case of septic infection but not of puerperal origin. Such the postmortem showed, the pathologist giving as cause of death, acute ulcerative ileocolitis. Death occurred on the ninth day of the puerperium.

Late in the case, hemoglobin was 45 per cent. Red blood cells 2,870,000, white blood cells 9,600, differential count normal. Widal negative. Blood culture negative, both antemortem and postmortem.

CASE 2.—H. W., colored, thirty-three years of age, admitted to the Philadelphia General Hospital July 12, 1928, approximately seven months pregnant. Four healthy children living. No history of serious illness or of complicated pregnancy or childbirth.

Chief complaint on admission, "Cannot see, sleepy." Illness began one week before admission with headache and spots before the eyes. Edema of the lower extremities present. Two convulsions occurred before admission. Blood pressure on admission 280/150 minimum blood pressure 184/124. Free venesection was done, morphine sulphate given, glucose intravenously, later magnesium sulphate by the same route. Within a few hours after admission, four severe convulsions occurred, each lasting several minutes. Colonic irrigation was repeatedly given, fluids forced. Delivery of a small stillborn fetus occurred the day subsequent to admission. Improvement failed to follow delivery, unconsciousness and coma prevailing. Urinalyses showed extreme kidney damage, albumin, blood, casts.

Phenolphthalein test, none first hour, 5 per cent second hour. Blood urea 18, blood sugar 150.

Clinical diagnosis: eclampsia; acute tubular nephritis. Yet, throughout the puerperium, ending by death in five days, there was abdominal distention, abdominal pain and tenderness developing, with frequent liquid stools, foul, black, later blood stained.

The temperature varied little from the normal, pulse 95 to 125.

Pathologic diagnosis: acute ulcerative colitis. Chronic diffuse nephritis.

CASE 3.—G. F., colored, aged thirty-five years. Admitted to the Philadelphia General Hospital, December 3, 1930. Father died of "a stroke," mother living, an epileptic. Six children living and well. Tonsillectomy in 1924. Two previous pregnancies, were complicated by serious toxemia. August, 1925, near term, with preeclamptic toxemia, patient gave birth, in the Samaritan Hospital, to a still-born child. Labor was induced. On admission, her blood pressure was 260/150. X-ray showed many apical abscesses of the teeth. The urine showed no abnormality except a cloud of albumin and a few leucocytes. Again, February, 1927, she was admitted to the same hospital, with toxemia, five months pregnant. Blood pressure 160/90, urine as before; blood, hemoglobin 50 per cent, otherwise approximately normal. Patient refused to remain more than four days for treatment.

For one week before admission to the Philadelphia General Hospital, patient is said to have complained of headache, pain in the back, nausea and vomiting, blurred vision; reported also, to have had oliguria and hematuria. She had, within a few hours before admission, two severe convulsions. When admitted, temperature was 98°, pulse 120, there was noisy restless delirium, and mouth soiled with bloody mucus. Physical examination revealed no gross abnormalities. An apparently pregnant uterus reached midway from symphysis to umbilicus. Blood pressure was 230/120. Urine showed a cloud of albumin, many leucocytes, many hyaline and granular casts. Blood Wassermann was negative. Red blood cells 2,610,000; white blood cells 18,250; hemoglobin 55 per cent. Differential count was normal; urea nitrogen 55, later 70 to 150; sugar 166; creatinine 3.1, later 6.4 to 12.6. Spinal tap, fluid clear, under no excess pressure.

The patient received sedation, temporarily, with sodium amytal. Treatment included venesection, glucose and magnesium sulphate intravenously, dry hot packs, colonic irrigation. Fluids given freely by hypodermoclysis and intravenously. Patient became comatose, from which she aroused but little throughout the course. The last day of illness tremor was present, and one convulsion occurred. Abortion

of a four months' pregnancy occurred the day following admission. Blood pressure had meanwhile become subnormal; following delivery, 110/65. No improvement in general condition occurred. Patient died five days subsequent to admission. Clinical diagnosis: An acute exacerbation of a chronic nephritis, complicated by an early pregnancy; uremia, pyelonephritis; heart failure.

Pathologic report, cause of death: chronic nephritis; ulcerative enterocolitis.

It seems that colitis, as a complication of pregnancy and the puerperium, has been seldom recognized. Very few books mention colitis. Berkeley and Bonney⁴ casually remark that inflammation of the sigmoid has been described as a complication of pregnancy. DeLee⁵ mentions, as possibly a part of the pathology of puerperal septicemia, gastritis, enteritis and colitis. Medical literature, we believe, contains

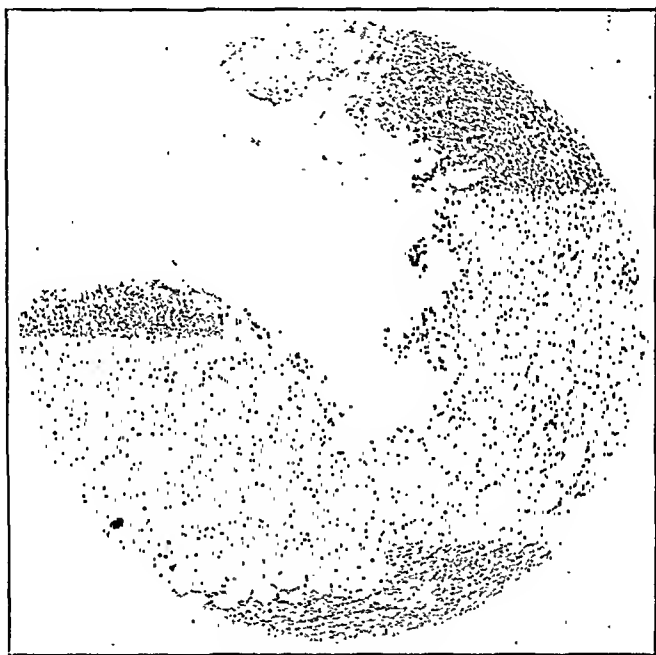


Fig. 3.—Case 3. Ulcer of colon.

comparatively little. Review of the complete files of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY fails to find mention of colitis. Search, also, of the last ten volumes of *Surgery, Gynecology and Obstetrics*, and of the Supplement, *International Abstracts of Surgery*, is rewarded by little upon the general subject, none upon its relation to pregnancy.

Positive diagnosis of ulcerative colitis, in pregnancy or the puerperium, which may require the barium enema and the x-ray or the sigmoidoscope, is frequently difficult. Symptoms of the condition are not unlikely to be obscured by the symptoms of other grave conditions or to be mistaken for the symptoms of the latter. Successful treatment, which may require ileotomy, to divert the fecal current, may be, in such cases, of doubtful expediency.

In only one of our cases was a probable diagnosis made. The symptoms in all, however, if properly comprehended and analyzed, point quite definitely to the condition: Abdominal distention, pain, tenderness, very frequent foul, dark liquid stools (blood stained at times), prostration, anemia, tachycardia in all, fever in the septic case. Bargaen and Weber⁶ observe: that a septic type of fever occurs in the severe fulminating cases.

Review of the records at the Philadelphia General Hospital of 100 patients dying apparently of toxemia of pregnancy or of puerperal sepsis, yielded 18 cases submitted to postmortem examination. Two of our cases are of this latter number. A third case was reported, by the pathologist: "Intestines, mucosa coated with thin membranous exudate." A fourth case, "Mucous membrane of the large bowel is the seat of small hemorrhagic points." The remaining 14 cases, showed "no gross pathology of the mucosa of the intestines."

The few cases we present justify certainly no positive conclusions, but suggest, we believe, some pertinent comments.

Recall conditions inherent in pregnancy, most of them accepted by the profession: Increased metabolism due to the growing fetus with its secundines, and to tissue normally added to the maternal organism (many pounds). Both anabolism and katabolism are at high tension. The organs of elaboration, assimilation and excretion are subjected to an overload. Logan has expressed the belief that the basic etiologic factor in ulcerative colitis is metabolic disturbance. Kidneys, liver, one or perhaps both, partially fail in their function. A toxemia of pregnancy ensues. We believe every pregnant woman to be more or less toxic. Bargaen⁷ reports that in his series of 268 cases, 3 showed renal insufficiency. He says, "Renal insufficiency as a complication of severe dysfunction of the colon is serious. Demonstrable renal injury has occurred only rarely in this series. Evidence of such impairment has included albuminuria, hematuria, edema, increased blood urea, and elevation of blood pressure, as well as changes in the ocular fundi." Renal insufficiency, with the above symptoms, is a frequent complication of pregnancy. The colon is called upon in pregnancy for extra work in its large function of excretion, both mechanical and absorptive. How essential it is, we realize, that the bowel, in pregnancy, regularly perform its excretory function! Excess of toxic material weakens the resistance of the mucosa.

Constipation, inertia of the bowel, due partly to mechanical interference by the enlarged uterus, is another factor contributing to colon dysfunction. The blood and lymph streams of the bowel, perhaps polluted, suffer in like manner, mechanical interference also. In many cases, the whole organism of the pregnant woman has a lowered resistance to the inroads of various complicating diseases. What a melancholy example of this the pregnant woman presented in the

severe epidemic of influenza of 1918! The morbidity and the mortality were terrific. It is quite plausible that labor may traumatize the bowel, especially one already diseased.

Could there be a group of conditions better suited than these outlined as predisposing to the primary development of a colitis in the pregnant and parturient, or one more favorable especially for an acute exacerbation of a preexisting bowel lesion? This seems particularly so in cases of grave toxemias or infections of pregnancy or of the puerperium. Bacteria, normally present in the colon or others accidentally introduced, even though not violently virulent, or blood-borne organisms, find but little resistance to their invasion of the bowel wall and to their destructive inroads of the tissues.

Our studies have led us to the conviction that colitis is a more frequent complication of pregnancy than the profession has realized; that the severe form, illustrated by cases herewith presented, is probably not uncommon in pregnancy and in grave puerperal conditions, and not rarely the chief decisive factor in fatality. Doubtless the latter was true in our cases. Indeed one of our patients, Case 1, showed no pathology that could be ascribed directly to pregnancy or to the puerperium, strongly suggesting that the symptoms of the disease under discussion may so simulate those of a puerperal condition as to lead to a false diagnosis.

We hope the presentation of this limited study will stimulate closer observation and more intensive investigation of the pregnant, parturient and puerpera, especially of those apparently septic or toxemic; and secure, in fatal cases, when possible, a postmortem. By such a course we venture to hazard the prediction that the future will reveal a considerable number of cases of ulcerative colitis complicating pregnancy and the puerperium.

REFERENCES

- (1) *Logan, A. H.*: Northwest Med. 18: 1, 1919. (1) *Bargen, J. Arnold*: Arch. Int. Med. 45: 561, 1930. (3) *Yeomans, Frank C.*: Simple Ulcerative Colitis, Proctology, New York, 1929, D. Appleton & Company. (4) *Berkeley, Comyns, and Bonney, Victor*: The Difficulties and Emergencies of Obstetric Practice, 1904, P. Blakiston's Son & Co. (5) *DeLee, Joseph B.*: The Principles and Practice of Obstetrics, 1928, W. B. Saunders Company. (6) *Bargen, J. Arnold, and Weber, Harry M.*: Surg. Gynec. Obst. 50: 694, 1930. (7) *Bargen, J. Arnold*: Ann. Int. Med. 3: 336, 1929. *Santee, H. E.*: Ann. Surg. 87: 704, 1928.

2211 LOCUST STREET.

6204 LIMEKILN PIKE

(For discussion, see page 946.)

CLINICAL OBSERVATIONS ON THE ETIOLOGY OF ICTERUS NEONATORUM*

BY MORRIS FRANKLIN, M.D., PHILADELPHIA, PA.

(From the Obstetrical Service, Temple University Hospital)

ACCORDING to various authorities, icterus neonatorum has been estimated to appear in 16 to 84 per cent of all newborn infants. In spite of the frequency of this condition, no single theory has yet been advanced which explains its exact etiology or its method of production.

Numerous theories have been recorded by the many research workers who have been seeking an explanation of this disease. S. Van Creveld of Amsterdam published in 1925, his comprehensive survey of the numerous conceptions of the origin of icterus neonatorum as they were recorded in the writings of the many research workers. In 1929, Goldbloom and Gottlieb of Montreal, Canada, published their comprehensive paper on this subject. In these two papers one can find a review of all the theories existing up to that time.

The fact that one can refer so easily to the above-mentioned excellent reviews of the subject makes it unnecessary for me to go into detail about the numerous theories. However, I shall enumerate all the theories discussed in those reviews and also the theories of more recent publication. The theories are as follows:

1. Icterus neonatorum is caused by a patulous ductus venosus arantii.
2. That it is caused by insufficient function of the liver.
3. That it is produced by infectious intestinal catarrh, with inflammation of the bile ducts and occlusion of the ductus choledochus.
4. That it is produced by an increased blood destruction.
5. That it is caused by an increased destruction of maternal blood.
6. That it is the result of infection due to aspiration of mucus and bacteria from the vagina.
7. That it is produced by excessive blood destruction due to hemorrhage or trauma.
8. That it is caused by excessive hemolysis.
9. That it is caused by edema of Glisson's capsule.
10. That it is produced by an excess of blood entering the child's circulation from the placenta at the moment of birth, the excess being hemolyzed.
11. That it is caused by an incompatibility of the bloods of the mother and the newborn.
12. That it is produced by an hyperactivity of the reticuloendothelial system.

*Read before the Obstetrical Society of Philadelphia, February 5, 1931.

CLINICAL OBSERVATIONS

On several occasions I noted the appearance of icterus in the newborn infants two or three days after their birth. In several such cases in which this condition manifested itself, the cords had been clamped and tied after a considerable delay. Where the cords were clamped or tied immediately after the birth of the child no icterus developed. These observations with their probable explanations I brought to the attention of Dr. J. O. Arnold. He, thereupon, informed me that the incidence of icterus in his private practice was very low because of his habit of clamping the cord immediately upon the birth of the newborn.

As a result of our discussion, a series of clinical observations were first made in 87 ward cases. The following are the results:

1. Of 18 cases in which the cords were clamped three or four minutes after birth, or sooner if pulsation of the cord ceased, 8 developed icterus.
2. Of 3 cases in which the cords were clamped five minutes after birth of the child one developed icterus and two remained negative.
3. Of 10 cases in which the cords were clamped after the placentas were detached, 5 developed icterus.
4. In one case in which the cord was clamped fifteen minutes after the birth of the child while the cord was still pulsating, no icterus developed.
5. Of twins in which the cords were clamped and tied while they were still pulsating, icterus developed in the second born.
6. Of 51 cases in which the cords were clamped or tied immediately after birth, while the cords were still pulsating, 9 developed icterus and 42 remained negative.
7. Of 2 cases delivered by cesarean section the cords were clamped immediately after birth and no icterus developed.

To summarize we had 32 cases in which there was a variable amount of delay in clamping the cords. Fourteen of those cases or 43.75 per cent developed icterus.

Of the 55 cases in which the cords were clamped immediately after birth, or while the cords were pulsating only 10 cases or 18.2 per cent developed icterus.

Further observations on 84 cases both ward and private yielded the following results:

Of 42 cases in which the clamping of the cords was delayed one minute or more, 20 cases or 47.7 per cent developed icterus.

Of 42 cases in which the cords were clamped in less than one minute, 14 cases or 33.3 per cent developed icterus.

In 4 cesarean cases in each of which the placenta was under the incision, and necessitated its manual separation to permit the delivery of the infant, icterus developed in each.

It appears from the above data that something enters the circulation of the newborn to produce icterus, more so if clamping of the cord is delayed. The explanation of how this thing enters the circulation of the newborn and why it produces icterus, will be more readily appreciated only after one is familiarized with the following facts

and figures which have been obtained from published papers on icterus neonatorum and infant physiology.

1. All newborn infants have a high bilirubinemia, and hence icterus is present in 100 per cent of all newborn infants even though there be no clinical manifestations in some cases.
2. They all have a polycythemia, a high hemoglobinemia, and an increased fragility of the red blood cells.
3. Cord blood hemolyzes rapidly.
4. The relative weight of the liver in the newborn baby is one and a half times that in the adult.
5. The relation between the capacity of the gall bladder and the weight of the liver in the newborn infant is 1:58, while that in the adult is 1:20-25. From this, one must conclude that the capacity for the production of bile must be small in early infancy in spite of the relatively large size of the liver in infants.
6. In early infancy the liver and spleen are still hematopoietic organs.
7. The quantity of blood in the newborn is equivalent to $1/20$ - $1/19$ of its body weight. This can be increased to $1/11$ or even to $1/7$ if all the placental and cord blood is permitted to enter the circulation of the newborn infant.
8. About 100 c.c. of blood can be expressed from the placenta and cord.

Knowing the above facts and figures, let us take an hypothetical case of a newborn infant weighing seven pounds and take $1/20$ of its body weight as the quantity of blood in its circulatory system. This will be equivalent to $7/20$ pound or 150 c.c. of blood. If clamping of the cord is delayed in this case, the placenta which is compressed with every contraction of the uterus forces from 40 to 60 c.c. of placental and cord blood into the circulation of the newborn baby. The circulation is overloaded by 26 to 40 per cent of blood; overloaded by blood which is high in bilirubin content; by blood in which the red blood cells are more numerous and more fragile; by blood that hemolyzes more rapidly. Imagine the effect of such overloading of the circulation of the newborn infant in whom the liver and spleen are still hematopoietic organs and not sufficiently mature to dispose properly of excess degenerated red blood cells and excess hemoglobin. Theoretically this should produce icterus in the newborn.

COMMENTS

One may ask why some infants develop icterus even when the cord is clamped immediately, while others in whom clamping of the cord is delayed no icterus is developed. To this one may add that if the uterus has good tone and contracts strongly on an early detached placenta immediately after the birth of the infant, sufficient blood may be forced into the infant's circulation before the cord is clamped to produce icterus. Where the uterus is markedly relaxed, or where the placenta remains undetached for a period at least as long as the delay in clamping the cord, the delay will not produce icterus. On two occasions where tying of the cord was delayed two and eight minutes respectively, an undetached placenta had to be removed from

a relaxed uterus in each case after waiting fifteen to twenty minutes after the birth of the child. On one occasion where the clamping of the cord was delayed two minutes an incompletely detached placenta had to be removed manually from a markedly relaxed uterus which required constant attention for over one hour. In none of those three cases did icterus develop.

CONCLUSION

While not one of the theories enumerated explains the primary cause of icterus neonatorum, it may be said that some of them do explain secondary causes which are partly responsible for this condition.

The theory that the uterine contractions after birth so compress the detached placenta as to force placental and cord blood into the circulation of the newborn and thereby produce the clinical signs and symptoms of icterus neonatorum seems to be the primary cause. The intensity of the icterus seems to depend on the relative proportion between the quantity of blood forced into the circulation of the newborn and the quantity of blood which should normally be possessed by that infant.

While the avoidance of delay in tying or clamping the cord will not eliminate icterus neonatorum entirely, it apparently, however, will reduce its incidence materially.

REFERENCES

Goldbloom, A., and Gottlieb, R.: Am. J. Dis. Child. 38: 57, 1929. *McKenney, Mitchell J.*: Am. J. Dis. Child. 38: 518, 1929. *Van Creveld, S.*: Am. J. Dis. Child. 30: 240, 1925. *Feldman, W. M.*: Ante-natal and Post-natal Child Physiology, Sect. III, Chap. XXIX, Chap. XXXI; Sec. VII, Chap. XXI.

7146 OGONTZ AVENUE.

REPORT OF A CASE OF ENDOMETRIOSIS OF THE UMBILICUS*

BY WILLIAM MCL. THOMPSON, M.D., CHICAGO, ILL.

THIS condition has been described under various titles as adenomyositis, adenomyosis, adenomyoma and endometriosis.

As is usual in a new field, pathologists were at first vague and unsettled in their classification of these tumors. It remained for T. S. Cullen to collect and analyze the reports of the observers up to the time of the publication of his book on *Umbilical Tumors*. At least



Fig. 1.—Endometriosis of the Umbilicus. Section of umbilical adenomyoma showing glands, endometrial in type, surrounded by characteristic stroma.

seven different hypotheses have been defended in explanation of endometriosis.

Briefly they are: (1) Embryonally misplaced tumors, either wolffian or mullerian; (2) postnatal displaced tissue (Wallstein); (3) direct invasion from endometrium or endosalpinx; (4) derivation from the peritoneum (R. Meyer); (5) metaplasia of lymph vessels and spaces; (6) metastatic transplantation through lymph vessels as in cancer (Halban); (7) transtubal transplantation (Sampson).

*Read at a meeting of the Chicago Gynecological Society, January 16, 1931.

I saw this patient with Dr. Frank Wieland. She was an American, forty years old and unmarried. She complained of a tumor of the umbilicus which she had been aware of for five years and which had been increasing in size.

Her father died of diabetes; her mother was living and well; one sister died of liver trouble; one brother was living and well.

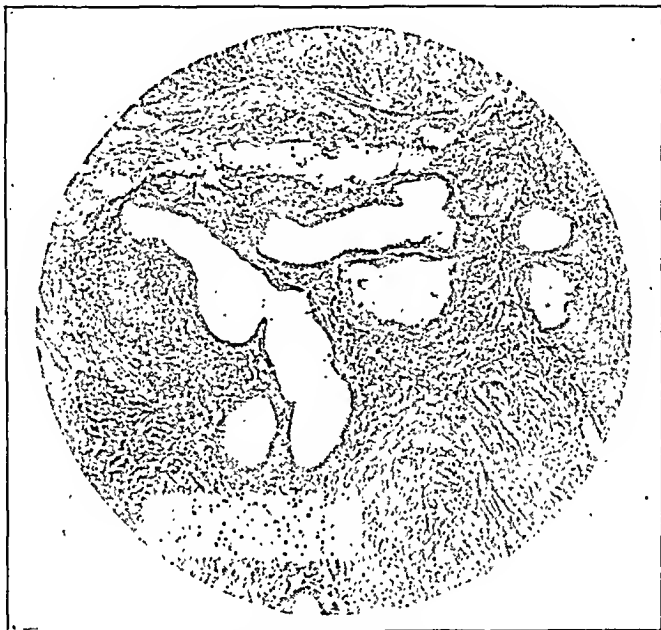


Fig. 2.—Endometriosis of the Umbilicus. Another section from another portion of the tumor. Here the glands show some degree of dilatation.



Fig. 3.—Endometriosis of the Umbilicus. A higher power photomicrograph of a portion of Section 1, showing in more detail the interglandular stroma.

The patient said that five years ago, on raising a window, she experienced a slight burning sensation in the region of the umbilicus. Soon afterward she noticed a small protrusion which was painful at intervals corresponding to her menstrual periods. As her menses appeared the tumor became enlarged and bluish in color. There was no discharge of blood from the tumor at any time.

Her menses began at the sixteenth year and were painless, but irregular until the last few years. She had had the usual childhood diseases. She later had a nervous disorder. She had had no operations.

The time of the appearance of the tumor corresponds with the time noted by other reports. Cullen specifies from thirty-five years of age to the menopause.



Fig. 4.—A section of adenomyoma of the uterine wall for comparison of the gland tubules.

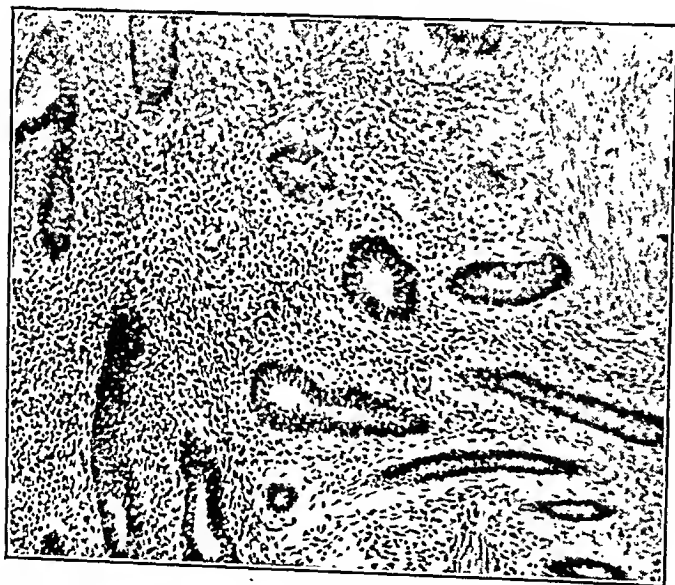


Fig. 5.—Another section of uterine adenomyoma.

The other notable feature that suggests the diagnosis and has been mentioned before was the exacerbation coincident with the menses.

The tumor on removal was the size of a large lemon. The outer boundary consisted of fat and skin. The adenomyoma occupied the center of the tumor and was

about two-thirds the diameter of the whole mass. The tumor was not connected with the peritoneum, nor was the skin surface broken. Macroscopically, the central mass was hard and firm with small soft areas containing blood. Microscopically, it resembled an adenomyoma showing glands endometrial in type, lined with columnar epithelium. They are more irregular in shape than the glands found in the normal endometrium. They are surrounded by characteristic stroma. There is connective tissue pushing in from the border of the tumor.

Cullen in his book published in 1916, reports twelve cases collected from other observers and adds one case of his own. In 1920 he reported two additional cases.

In a collection of over 2,000 cases of adenomyoma from one clinic, only one case of umbilical adenomyoma was noted. In another statistical collection of 494 cases one case was noted. In this Society endometriosis of ovaries, peritoneum and abdominal scar have been reported by Heaney, Culbertson, Dorland, Danforth, and Goldstine, but this is the first report from this Society of an umbilical tumor of endometrial type, so far as I am aware.

REFERENCES

- (1) *Andrews, H. R.*: J. Obst. & Gynec. Brit. Emp. 32: 545, 1925. (2) *Baltzer, H.*: Arch. f. klin. Chir. 147: 555, 1927. (3) *Baltzer, H.*: Centralbl. f. Gynäk. 53: 99, 1929. (4) *Cullen, T. S.*: Embryology, Anatomy and Diseases of the Umbilicus, Together With Diseases of the Urachus, Philadelphia, 1916, W. B. Saunders Company. (5) *Cullen, T. S.*: Arch. Surg. 1: 279, 1920. (6) *Edwards, C. R., and Spencer, H. R.*: Arch. Surg. 11: 684, 1925. (7) *Födör, V.*: Beit. z. klin. Chir., Tübingen 138: 255, 1926. (8) *Frero, A. J.*: Bol. Soc. de obst. y. ginec. 8: 516, 1929. (9) *Keene, Floyd E., and Kimbrough, Robert A.*: Two Cases of Umbilical Endometriosis, J. A. M. A. 95: 1164 (October 18), 1930. (10) *Köhler, R.*: Centralbl. f. Gynäk. 51: 2201, 1927. (11) *Lauche*: Virchow's Arch. 253: 298, 1923. (12) *Lilievre and Montpellier*: Bull. de l'Assoc. franç. p. l'étude du cancer, 16: 871, 1927. (13) *Mahle, A. E., and McCarty, W. C.*: J. Lab. & Clin. Med. 5: 218, 1920. (14) *Oberling, C., and Nickel, P.*: Bull. de l'Assoc. franç. p. l'étude du cancer 16: 691, 1927. (15) *Roques, Frederick*: Proc. Royal Soc. of Med. 21: 24, 1928. (16) *Schiffmann, J., and Seyfert, W.*: Arch. f. Gynäk. 127: 208, 1926. (17) *Stacy, Dreps, Offrett, and Moench*: M. Clin. N. Amer. 10: 671, 1926.

25 EAST WASHINGTON STREET.

(For discussion, see page 949.)

A REPORT OF THREE CASES OF PLACENTA SUCCENTURIATA

BY EDWARD G. WATERS, PH.B., M.D., F.A.C.S., JERSEY CITY, N. J.

(Attending Obstetrician, Christ Hospital; Attending Surgeon, Fairmont Hospital;
Associate Surgeon, Jersey City Hospital)

PLACENTAL abnormalities are presumed offhand to contribute in a negligible degree to obstetric pathology. One is accustomed to see variations from the accepted normal; the discoid placenta with eccentric insertion of the cord, the thin-spread placenta membranacea, the concave placenta circumvallata, the joined, though divided bipartite or tripartite placenta, the battledore placenta with marginal insertion of cord, placentae with small calcareous deposits, small, often multiple infarcts and occasionally marginal infarcts, giving a marginal ring of thickened yellowish-white sclerotic tissue, all are of interest but of little moment. They are serious neither to mother nor child.

There is, however, one abnormality which is encountered occasionally, and since it may be of paramount importance, should always be looked for, namely, placenta succenturiata. There may be one, or, less commonly, more small additional placentae developed on the chorionic surface, nourished from the main placenta by one or more vessels, which are either free or imbedded in placental tissue. These aberrant placentae vary considerably in size, but rarely reach more than one-sixth to one-eighth the size of the true placenta. The single succenturiates attain the largest size.

Placenta succenturiata joins the group enumerated above as an innocuous and interesting variation provided it is delivered intact with the major placenta. If it does not accompany the placenta proper, it often constitutes an insidious threat to the mother's health and life. There is little statistical data as to its frequency. It is my impression that it is found about once in every 500 deliveries. Doubtless many are seen and not reported, and probably a far greater number are not recognized. When it occurs, one of several things may happen. (1) Usually, and fortunately, it delivers with the main placenta and membranes. (2) The vessels between it and the main placenta may be ruptured if intrauterine manipulations are necessary, with immediate hemorrhage. (3) It may be left behind when the main placenta is delivered, with subsequent severe hemorrhage. (4) Its existence may be overlooked, and a vicious form of sepsis may supervene during the puerperium. (5) It may become fibrosed and remain firmly adherent to the uterus, to give rise to menorrhagia, metrorrhagia and persistent vaginal discharge. (6) Finally, as in my experience, it may by its

very position jeopardize the patient's life. Almost all of these can and should be averted by the attending obstetrician.

There is one infallible method for detecting its presence, and that is adequate and intelligent inspection of the delivered placenta. If one avoids too early and too vigorous attempts to deliver the placenta before it has left the uterus, it suffers no tears, and if held in the palms of both hands, maternal side upward, presents an unbroken surface traced only by normal intercotyledon markings which interdigitate accurately. If tears are present, they approximate accurately when held in this position. If a void exists, it is readily apparent. The placental margin is regular and unbroken, and no broken blood vessels are found. If lacerated tissue or broken blood vessels are found at the placental margin, suspect a succenturiate placenta. Except in marginal and velamentous insertion of the cord, broken blood vessels in this location mean torn off accessory placentae. If the placenta and membranes are inverted, the latter should present no defect except at the site of fetal extrusion. If the method of Credé is employed too early and too vigorously, the membranes may be so ragged and torn as to leave doubt as to their delivery in entirety. It is only a theoretical possibility for a succenturiate placenta to strip away from the amnion, leaving that layer of the membranes intact, and remain in utero.

Once a diagnosis of retained placenta succenturiata is made, the treatment consists in its removal. This may be attempted medically by the use of oxytocics, but the procedure of choice is manual removal as with adherent placenta.

My attention was directed to this subject by observing three serious complications of this abnormality within a year. The first occurred in a primipara, twenty-eight years old, whose normal delivery was followed in ten days by a purulent vaginal discharge. This increased in amount and fetor until three weeks postpartum, when she was seen in consultation. The discharge was heavy, grayish yellow, of very foul odor, giving off gas bubbles and on culture containing *B. coli* and mixed staphylococci. After other means of treatment were unavailing, digital exploration of the uterus revealed a soggy, spongy mass about 6 cm. in diameter partly filling a large atonic puerperal uterus. The mass was removed digitally, and the uterus irrigated with hot chlorazene solution. The discharge stopped in twenty-four hours and recovery was uneventful. The mass was a well-defined placenta.

The second patient was seen in consultation eight months after delivery, with a history of menstrual irregularity since parturition. There were recurring menstrual and intermenstrual hemorrhages of increasing severity. The uterus was found more than twice its normal size, slightly tender, with no other demonstrable pelvic pathology. A diagnostic curettage brought away considerable fibrotic tissue of spongy texture. A microscopic examination showed ill-defined villi, without definite cellular covering, buried in a formless granular fibrin matrix. A few fairly well preserved villi were visualized. In this instance, the attendant had examined the placenta and recorded it as delivered intact, although the condition of the membranes was not mentioned. The clinical result of the operation was good, as normal menstruation was established five weeks later.

The third instance occurred recently in my practice. A primipara, twenty-six years old, reached term after a normal pregnancy. A sudden vaginal hemorrhage came on which ceased on rest in bed and large doses of morphine. A diagnosis of marginal separation of the placenta was made, since the placental bruit could be distinctly heard near the level of the umbilicus on the left. The vertex was presenting, in an L.O.A. position. Recurrence of the bleeding with onset of labor ensued. The irregular type of bleeding, independent of uterine contractions, with placental bruit heard well above the lower uterine segment, was confusing. Rectal examination showed a $3\frac{1}{2}$ finger dilatation with a mass resembling placental tissue between the cervical os and presenting part. The patient was prepared for cesarean section and careful vaginal examination made after induction of spinal anesthesia in the operating room. Almost full dilatation was found with placental tissue covering nearly three-fourths of the cervical os. Vaginal delivery seemed feasible and was effected with Dewee's forceps. Bilateral cervical, left vaginal, and median perineotomy wounds were repaired and the placenta delivered. A large succenturiate placenta, 10 cm. in diameter and weighing more than 220 gm. was found to be the placenta previa, separated from the true placenta by about 4 cm. with no intervening bridge of placental tissue. The placenta proper weighed 440 gm. and was 17 cm. in diameter, discoid in shape with normal eccentric implantation of the cord. One of the major divisions of the umbilical vein, accompanied by two small arteries, left the placental margin and coursed over the free chorionic surface to the edge of the placenta succenturiata, where it ramified with the other vessels in the substance of this remarkably large "pretender." In this instance, consideration of the possibility of an accessory placenta might have clarified a confusing association of findings.

SUMMARY

The first two of these three experiences emphasize the necessity of careful placental and membranal examination after the third stage of labor, and the last may well be a caution to at least consider the existence of this abnormality if placenta previa is suspected.

39 GIFFORD AVENUE.

Giordanengo: Experimental Research on the Action of Amniotic Liquid on the Formation of Postoperative Peritoneal Adhesions. *Ann. Ital. di Chir.* 9: 543, 1930.

To study the effect of absorption of the heterogeneous amniotic fluid by the peritoneal serosa, the author injected into two rabbits 15 c.c. of amniotic fluid. These experiments gave entirely negative results.

Amniotic fluid is not capable of stimulating or preventing proteolysis in vitro, nor to provoke, in the peritoneum, inflammatory plastic reactions, rather it has shown a reaction analogous to that obtained with the introduction in the organism of heterogeneous proteins; namely, hyperthermia and hyperleucocytosis of a transitory nature.

SYDNEY S. SCHOCHET.
JULIUS E. LACKNER.

UNUSUAL CASE OF ECTOPIC PREGNANCY

By R. S. SMYLIE, A.B., M.D., SAN DIEGO, CALIF.

ECTOPIC pregnancy of itself is not a rarity, yet there are comparatively few cases reported in the literature which have reached the full period of gestation.

The case reported herewith attaches a special interest to itself because of the fact that the condition was not recognized in the prenatal out-patient clinic, by the entire absence of symptoms and the misleading gross appearance of the uterus as revealed at the time of operation.

Mrs. E. V., colored, aged thirty-seven, married, gravida ii, one living child, full-term normal delivery, three years ago with uncomplicated puerperium.

Admitted to the out-patient prenatal clinic of the Memphis General Hospital, Oct. 1, 1929. Last menstrual period Feb. 19, 1929 (?). Expected date of delivery Nov. 26, 1929. Pelvis normal urine negative, Wassermann not reported. Blood pressure 110/60.

Patient admitted to the hospital Oct. 1, 1929 at 12:30 P.M. at which time she was examined by the resident obstetrician who noted that the patient was having regular cyclic abdominal pains limited to the pelvis and occurring every ten to fifteen minutes, lasting thirty to thirty-five seconds. The abdominal wall was thin, relaxed and flaccid. The uterus was palpable with the fundus 20 cm. above the symphysis. No fetal heart sounds or fetal movements were made out. The fetal head approximating in size that of a full-term fetus was easily palpable in the left hypochondrium with the small parts anterior. The breech was felt to the right and the long axis of the fetus was lying transversely to the maternal longitudinal axis.

Rectal Examination.—The uterus was readily outlined, enlarged to the size of a four and a half to five months' gestation, irregular, firm, mobile, not tender, and definitely separated from the fetus lying above it. The cervix was firm, small, admitted the tip of the one finger, movable without pain, and 2 cm. in length. Hegar's sign could not be elicited. Chadwick's sign was present.

A diagnosis of extrauterine pregnancy approximating full term with a dead fetus was made.

Immediate roentgenogram of the abdomen revealed the fetal skeleton lying transversely in the upper abdomen with the head on the left side, breech to the right, small parts anterior. No fetal parts were seen in the pelvis and none below the level of the fourth lumbar vertebrae. The skull showed considerable distortion and overlapping of the bones. Roentgenographic diagnosis was extrauterine pregnancy with dead fetus.

The present pregnancy was entirely uneventful. At no time had the patient experienced any sudden or acute abdominal pains or disturbance of the sensorium, nor had she had any vaginal bleeding or spotting or chocolate colored vaginal discharge.

The physical examination except as noted was essentially negative. The urine showed one-plus albumin. Blood count was normal with 85 per cent hemoglobin, and the blood chemistry was likewise within normal limits.

Operation on Nov. 3, 1931, under ethylenc-oxygen anesthesia revealed an apparently irregular roughly pear-shaped uterus, the size of a five months' gestation with several intramural fibromas the size of marbles in the anterior wall of the upper segment with the left cornua showing an apparent moderate degree of hypertrophy. An apparently full-term fetus contained within the intact amniotic sac was revealed lying transversely in the upper abdomen outside of and well above the fundus uteri.

No placenta could be seen. Issuing from what was apparently the anterior surface of the right cornua of the uterus through a circular opening about half the diameter of a lead pencil was the umbilical cord.

At the point of exit there was a spindle-shaped constriction of the cord, three mm. in diameter at its smallest part. This had evidently gradually impeded the fetal circulation to such a degree that fetal death from asphyxiation occurred.



Fig. 1.

Supravaginal hysterectomy was done leaving both ovaries. The patient made an uneventful convalescence and was discharged from the hospital on her nineteenth postoperative day.

It was thought when the uterus was examined in the gross that the placenta was attached to the endometrial surface of the uterus in the usual position. Section of the organ revealed that the uterine cavity was but 10 cm. in length, the walls thick and firm, and there was no communication between the uterine cavity and the area of placental attachment.

The placenta proved to be attached to the inner aspect of the wall of the lumen of the enormously dilated and hypertrophied right fallopian tube, the umbilical cord making its exit through a small circular opening 4 mm. in diameter on

the anterior wall of the tube. Fig. 1 shows the interesting features of the case very clearly.

Apparently early rupture of a pregnancy within the tube took place with extrusion of the embryo and amniotic sac into the free abdominal cavity and retention of the placenta within the tube followed by the usual development of the fetus, until its existence was terminated by constriction of the umbilical cord at its point of exit from the tube.

MEDICO-DENTAL BUILDING.

A NEW DEMONSTRATION EYEPIECE FOR TEACHING CYSTOSCOPY*

BY ISADOR W. KAHN, M.D., F.A.C.S., NEW YORK, N. Y.

(Assistant Professor of Gynecology and Chief of Female Cystoscopic Clinic, New York Postgraduate Medical School and Hospital)

IN TEACHING female cystoscopy to postgraduate students, great difficulty has been experienced in keeping the cystoscope focused on the area of interest, so that the student would see exactly what was seen by myself before passing the instrument to him, or when allowing him to look in while it was held in place for him. The mere change from teacher to student usually resulted in a shifting of

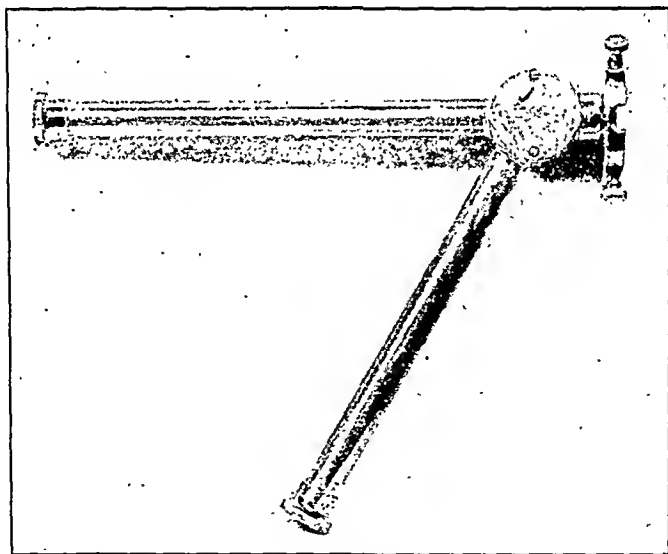


Fig. 1.

the focus, and the patient herself often displaced the instrument by moving about on the table. Using a fixed cystoscope holder, the cystoscope can be steadied, and the student is better able to view areas of interest, but only teacher or student can use the cystoscope at one time.

The new ocular attachment for the cystoscope I now present was devised with the idea of permitting teacher and student to inspect and study the bladder at the

*Presented to the Section of Obstetrics and Gynecology, New York Academy of Medicine, January 27, 1931.

same time, thus enabling the student to follow every move of the lens. He can observe intravesical operative procedures, ureteral catheterizations, indigo-carminé function tests, etc. The attachment can be used on an observation, catheterizing, or operating cystoscope, and was originally constructed for use on all Zeiss or Wolff cystoscopes, they being more popular in our female cystoscopic clinic.

The eyepiece consists of a clamping ring for attachment to the cystoscope, a revolving collar, a prism box with prism, and two ocular tubes with lenses. The image is received by the prism within the prism box and transmitted through a straight tube with special optic. It is also deflected at an angle of about 45 degrees and passed through a second tube for viewing by the second observer.

The object seen is a corrected image with slight magnification for teaching purposes. A special adapter has been added so that the eyepiece can be attached to a McCarthy, Brown-Buerger, Kollmorgen, and other cystoscopes that are now in general use. The instrument was made by George Wolff of Berlin. Although I have used this attachment in teaching female cystoscopy, there is no reason why the urologists cannot use it. It also readily permits the demonstration of a lesion in the bladder during the course of a consultation.

801 WEST END AVENUE.

Düntzer and Hellendall: Influence of Exercise on the Female Constitution, Labor and Menstruation. München. med. Wchnschr. 76: 1835, 1929.

The authors studied 1561 females participating in a German "Turnfest" to determine, if possible, what influence athletic activity has upon constitution, labor, menstruation, etc. The average age was 20.5 years, the oldest being 38 years, and the youngest, 15 years. About 33 per cent were of the so-called muscular type, something less than 30 per cent of the respiratory type, about 25 per cent of the cerebral, and 12 per cent of the gastric type.

The majority had relatively small pelvises. The external conjugate measurement was less than 18 cm. in 31 per cent, from 18 to 18.5 cm. in 35 per cent, and more than 18.5 cm. in 34 per cent. In evaluating these measurements one must remember that the panniculus adiposus is thin in these women. The authors feel that these findings do not indicate that athletic activity influences the size of the pelvis, but that the girl with a small pelvis is more attracted to sports than is the girl with a large pelvis.

Only 17 of the participants had gone through labor. Of these, 16 had normal labors, and one had an operative delivery because of intrapartum hemorrhage. Ten had continued their exercise during pregnancy. Thirteen found no change in their athletic ability after delivery; four found it lessened.

Several tables are given to show the effect of athletic activity on menstruation, of the latter on athletic ability, etc. In general, athletic ability was unchanged or improved in the majority (about 61 per cent) during menstruation; the great majority (about 82 per cent) noticed no effect of athletic activity on menstruation.

The conclusion is drawn that the ordinary, healthy woman may continue athletic work during menstruation, unless abnormal thermic conditions (either extreme heat or cold) are present.

A. SHULMAN.

Society Transactions

THE AMERICAN GYNECOLOGICAL SOCIETY

FIFTY-SIXTH ANNUAL MEETING

Hot Springs, Va.

MAY 18, 19, AND 20, 1931

(Concluding Installment)

7. **Plans and Equipment of the Gynecological-Obstetrical Out-Patient Department**, by Dr. Robert L. Dickinson, New York, N. Y. (This article will appear in the current volume of the Society's Transactions.)
8. **The Responsibility of the Medical Profession in the Mortality From Childbearing**, by Dr. George W. Kosmak, New York, N. Y. (See page 748, November issue.)

ABSTRACT OF DISCUSSION

DR. WILLIAM R. NICHOLSON, PHILADELPHIA, PA.—As the midwife has been mentioned, I would like to pay my respects to her for a moment. She is much maligned. We have, I believe, shown ample proof in Philadelphia that the midwives can be controlled. In Philadelphia, where we have a sufficient grant of money, we have the records of 90,900 cases of delivery by midwives. These cases are consecutive and include all deliveries from 1914 until the end of 1930. I have, personally, tabulated all these cases and know that the results are absolutely correct. In this fairly large number of deliveries we have had just 79 maternal deaths from all causes. It is to be remembered that these patients were delivered by midwives in their own homes, under conditions which were not particularly advantageous. Among these 79 deaths are not more than 50 deaths due to puerperal sepsis.

I emphasize the importance of midwife control. By this I mean actual inspection of their cases after delivery. Without this oversight or control, the midwife has always been, is, and always will be a menace.

* * *

To refer now to the main subject of the paper. I am firmly convinced that the mortality statistics in this country, as far as they concern midwifery, are going to be higher than they are now, unless there is a distinct change in the methods of obstetric teaching. One of the main reasons that our midwife statistics do not show a higher mortality is because the midwife does not have prophylactic version, prophylactic forceps, and cesarean section as part of her armamentarium. She does not think that a posterior occiput is such a terrible complication, and in most instances, of course very fortunately, she does not even know that it occurs. She is prepared to wait.

When we consider this matter so far as we in this Society are concerned, I am convinced that a great part of our maternal mortality depends on the teaching that the doctor has received and is still receiving. This does not mean only in the medical school, it means the teaching of interns in the hospital, and postgraduate students. It is perfectly true that in many, if not most cases of labor, cesarean

section or version is the easiest way out for the doctor. In the Graduate School of Medicine in the University of Pennsylvania, as well as in my service in the Methodist and Presbyterian Hospitals, I see interns and students from very many parts of the United States, from various medical schools, and I have been surprised to see how well up they are on various operative procedures, and yet how little they know about the mechanism and physiology of normal labor. I would venture to assert that not 10 per cent of the recent graduates in any year know anything about the lower uterine segment.

* * *

The question of narcosis in labor is one of tremendous importance in its bearing upon mortality. This was well stated by Dr. Kosmak in his paper. I claim, without fear of contravention, that any woman in labor can be made as comfortable as is commensurate with safety of mother and child, without the use of any of the newer methods or products which are now the fad. No one is more concerned than I to limit the pain of labor, and this can be done by the use of the tried remedies, such as morphine, scopolamine, gas anesthesia, rectal anesthesia, etc. On the other hand, I have a report from another city that in 1930, among the maternal deaths, spinal anesthesia had been used in 28 cases, 20 of them having been cesarean section. It is stated by the Committee that gave me the information that 6 of these deaths were entirely due to the anesthesia, each patient dying on the operating table. In January of this year, in this same city, there were 3 cases with one death. In my own city I know of 4 cases of death from spinal anesthesia in cesarean sections in the last four or five months.

Now it does not seem to me that there is need to go much further in this discussion. I do not believe that normal labor is taught today as it should be taught. That obstetrics is a surgical specialty and that it often demands skill in major surgery, goes without saying. It is also true that forceps, version and cesarean section are frequently indicated but they are none of them indicated nearly as frequently as they are performed. When I am told that one of my friends guarantees a painless labor, and when painless labor is carried out by forceful dilatation of the cervix, version and delivery under anesthesia, without the patient having had any labor pains whatsoever, I feel that it is not straining the truth to say that there is too much interference in labor, and until something is done to correct this tendency, our mortality statistics will not be better, since it is to be remembered that the general practitioner takes up all the published methods and uses them under conditions which to us would be absolutely prohibitive. At the present time statistics show definitely that it is safer for a woman to be delivered by a midwife under suitable control than in many hospitals.

DR. FRED L. ADAIR, CHICAGO, ILL.—I want to speak on the rôle that the hospital plays in this maternal mortality situation. Hospitals were originally designed for the benefit of the public and perhaps for the convenience of the doctor. It seems to me that they are not always working safely for the public. We have accumulated some data in connection with the White House Conference. Questionnaires were sent out to hospitals for information concerning the number of deliveries in the hospital during 1929, the number of maternal deaths, the number of versions, of forceps deliveries, and cesarean sections, and the number of deaths following these operations. The figures on the number of operative deliveries are considered to be fairly accurate.

The figures on deaths are presented with reservations as there is great probability that neither the total deaths reported by each hospital nor the number of deaths following cesarean, version and forceps deliveries are complete. The figures were tabulated just as given by each hospital and are presented for what they may be worth.

The questionnaire provided space for recording the deaths according to cause, such as puerperal infection, toxemia, hyperemesis gravidarum, uterine rupture, postpartum hemorrhage, etc., and it is very probable that in some instances at least the person who filled in the questionnaire reported the deaths according to cause and did not bother to ascertain whether there had been an antecedent forceps delivery or version. Cesarean sections are apt to be more prominently noted on the records, and it is felt that the reports on this item are more nearly complete.

The questionnaires were divided into two groups, those from hospitals having interns, of which there were 242, and those not having interns, of which there were 150. The percentage of deliveries by forceps, versions, and cesarean sections, and the percentage of the total number of maternal deaths preceded by forceps delivery, version, or cesarean section were calculated for the hospitals that gave the necessary information.

The figures on the incidence of operative deliveries in the two groups of hospitals show an interesting similarity. The total operative deliveries in the hospitals that reported on all three types of operations were approximately 24 per cent in the hospitals having interns and 25 per cent in the hospitals not having interns. By hospitals, it was found that the total operative deliveries ranged from less than 1 per cent to more than 70 per cent. For the separate items, the percentage of forceps deliveries was 17.6 in the hospitals having interns as compared to 18.3 in the hospitals with no interns. Three per cent of the deliveries in both groups of hospitals were by version and the percentage of deliveries by cesarean section was 2.6 and 2.7 for the two groups respectively.

The percentage of deliveries by forceps, versions, and cesarean sections was calculated for each of the 242 hospitals having interns and it was found that forceps deliveries ranged from 0.5 to 73 per cent, versions from 0.2 to 56.7 per cent, classic cesarean section from 0.1 to 14.1 per cent, and cervical cesarean sections from 0.1 to 5.1 per cent.

The low rates in some hospitals both for total operative deliveries and for the different operative procedures are offset by the high rates in others which bring up the rates for the hospitals as a group.

As to maternal deaths: The percentage of deaths among the cases delivered by the various operative procedures is undoubtedly affected by the number of hospitals reporting. If we had figures on these items for all the hospitals in each group the percentages would probably be different. Correlations should not be made between the percentages of deliveries by the respective operative procedures and the percentages of deaths known to have been preceded by each type of operation because the number of hospitals reporting on these items is not the same. For the hospitals that reported it was found that 7.4 per cent of the women who died had been delivered by forceps in the hospitals having interns, and 10.2 per cent in those not having interns; 7.4 per cent and 7.1 per cent respectively had been delivered by version; and 19.4 per cent and 35.2 per cent had been delivered by cesarean section.

We have no case histories either for the women who died or those who survived, and therefore we can only guess at the part played by operative deliveries both in maternal mortality and morbidity, but at least we do know that approximately one operative delivery out of every 4 or 5 cases is not conservative obstetrics.

DR. HUGO EHRENFEST, St. Louis, Mo.—Dr. Kosmak referred to the excellent report of Dr. Plass to the White House Conference. His report is but one of the 25 prepared by a committee of which I had the honor and pleasure to be the Chairman. The members of this committee held a meeting to discuss all these reports and arrived at conclusions, in part mentioned by Dr. Kosmak. We agreed among ourselves that the present, rather unsatisfactory, radical trend of obstetric practice to some extent has been forced upon the profession by the patients themselves. Most of you are

familiar with the effect of Miss Tracy's book dealing with twilight sleep. Some of you might have seen the recently published volume of a Mrs. Todd in which she extols the benefits of the Gwathmey method and advises the women of this country to demand its wide application. More and more women insist on a painless labor. An ever increasing number of parturient women are managed in hospitals, most of them are anesthetized, the family and not so rarely the attending physician are a bit impatient, short labors are generally preferred, and thus the temptation to shorten or terminate labor by artificial interference becomes practically irresistible. We decided to include in our recommendations the two following: Interference of any kind with pregnancy or labor should be limited to well defined indications. A warning should be disseminated that compliance with the insistent demand of women for shorter and painless labors inevitably implies risks both for mother and baby.

I might mention in conclusion that we also investigated obstetric conditions among various Indian tribes. One physician, reporting from one of the Indian Reservations, ventured the opinion that as far as obstetric work is concerned the medicine man of the tribe in general probably does less harm than many an obstetric faddist of the big city.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—I think the remark that the women themselves may be to blame is to some extent true but I do not think it absolves the doctor from the major part of the blame. The private clientele in the institution in which I am working comes from a neighborhood which contains a considerable percentage of the better class of people, the type of people who are very prone to demand every so-called improvement and I have been many times asked about this or that procedure which has been described in the *Ladies' Home Journal* or some similar periodical. I have had no difficulty in explaining to the intelligent woman where the soft spots were in such propaganda and have had little difficulty in having her follow such course as her medical attendant thinks wise. I believe a good part of this blame comes back to the medical profession. In this country of ours where everything is more or less free we have a large number of hospitals springing up, not altogether in the small communities, employing men who have escaped from medical colleges, having been educated in the manner Dr. Nicholson spoke of, attempting to do the things they have read about in journals and seen demonstrated by men of greater experience, and they are doing a great detriment to our profession and to the public.

DR. JOHN A. McGLINN, PHILADELPHIA, PA.—In Philadelphia last year we realized that the control of medicine is rapidly getting out of the hands of the doctor and into lay organizations. Our efforts were to not do away with the very worthy work that many of the organizations are doing but to have medicine take the leadership and recognize its duty to the public. As a result of that we are carrying out two studies this year, both advanced by the Philadelphia Health League but under the auspices of the Philadelphia Medical Society. One is a study of the mortality and morbidity of the pre-school child, and the second is a study of all the maternal deaths that occur in the city during a three-year period. We hope as a result of this study, just as has been done in New York, to get something of value so that we can place our finger on the difficulty. There is no question at all, and Dr. Nicholson has proved it, that labor in the main is a physiologic process and the less one interferes with it the better the results will be. The only difference between the midwife's situation and the doctor's situation is this, that he has control of the midwives; he can say to them what they can do and what they must not do and if they disobey orders their license to practice midwifery can be taken away from them. On the other hand, we have no such control over the medical profession and there is one thing which I think we should advise in all branches of medicine, that one of the most important things today is to

continue the education of the doctor after he leaves the medical school. That is not an easy thing to do. We have had the experience in Philadelphia in arranging programs for the County Medical Society. We thought we had some very important messages to the profession but while we have over 2,300 members of the Society, and approximately 3,000 men practicing in Philadelphia, we had less than 500 attending the meetings. In other words, at least 2,600 men in Philadelphia never attended a meeting of the County Medical Society. In solving this difficulty I think we should look further than the mere programs that are presented because I believe that the trouble goes farther back than the day of graduation. I am thoroughly convinced that medical education at the present time is not fitting men for the work which they should do. The resident will now speak very glibly of certain terms but he does not know anything about modern obstetrics nor about the minor complaints that he is called upon to treat. He is taught so much science which he does not absorb that he becomes discouraged trying to meet the problems which face him and trying to keep up with all the advanced scientific knowledge and he soon throws up the whole study and becomes a mere drone.

DR. ARTHUR H. BILL, CLEVELAND, O.—I do not believe that "painless labor" should be so severely criticized.

Reference was made to short and painless labor. Now that is a mistake for painless labor does not mean short labor and the two should not be confused. Nor does painless labor mean unwarranted interference. I think the reverse is likely true. It is said that the laity takes this matter into its own hands. They do during a labor in which the patient suffers greatly; they insist that the physician do something to terminate labor and sometimes put such pressure upon him that he interferes against his best judgment. My experience is that if the labor is painless, the patient and the husband are not fussing, the labor can go on as long as it should and no pressure is brought upon the doctor to interfere before such a time as he is justified in interfering. The cause of damage in labor is not interference per se but an improper manner and time of interference. I believe that the greatest damage done to the mother and child is due to interference before the first stage of labor is completed and that is the time when relief of pain enables the physician to be content and let the labor proceed and take its proper course.

DR. KOSMAK (closing).—I would like to give one reason that stimulated the writing of this paper, namely the responsibility which a Society of this kind should assume in the situation. I believe that the expert obstetrician, the obstetric specialist, has been content to sit on the side lines, as it were, and see his colleagues who were not so skilled do many of these complicated obstetric operations. The intimate contact which Dr. Polak and I have had with this Committee on Puerperal Mortality in New York City has shown us that in many of these fatal cases the attention was anything but skilled nor was the environment of the patient such that a safe major procedure could be conducted. It would seem to me, bearing these facts in mind, that an organization made up of men who know how those things are done should take a stand and in some way bring before the country a better knowledge of what safety is and how far the ordinary practitioner of obstetrics can go in these matters. I admit that perhaps as an editor of a journal I may have some blame to bear in this matter in publishing articles in which the writer describes a new procedure and stresses the ease with which it can be carried out. I sometimes feel like putting in a footnote calling attention to the fact that although this procedure may be safe for the writer of the article, it would not be safe in the hands of the average practitioner who is not so skilled as the writer. I believe that the time will come when organizations of specialists will have to present to the country a correct attitude as to how these things should be done.

9. **Clinical Study of Postoperative Value of Barbituric Acid Hypnotics,**
by Dr. Alice F. Maxwell, San Francisco, Calif. (By invitation.)
(See page 579, October issue.)

DISCUSSION

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—It is agreed that the preoperative use of barbiturates has a distinct value. Dr. Maxwell now shows us how this may be very greatly extended into the postoperative field.

I wonder in speaking of the paralyzing effect of morphine upon the bowel whether or not Dr. Maxwell considers that really is the physiologic effect of that drug? A statement has been made by Dr. Ivy, Professor of Physiology at Northwestern University, that opium derivatives in general were not to such a great extent as supposed, the producers of a paralyzing effect upon the bowel as they were producers of sphincter spasm. Possibly this spasm of the sphincter muscle might have more to do with the distention than the actual paralyzing effect upon the bowel muscle. The trauma to which the patient is subjected upon the table, length of time of operation, and intraabdominal manipulation, may have a very distinct effect upon postoperative distention. In a clinic such as that which Dr. Maxwell represents these factors would be reduced to a minimum. She brings out very interestingly too, the fact that we should use the drugs in a careful way, that the standard dose should not be set up, that we should use them according to the varying rate of excretion. It is interesting, too, to see that the simplest and from an economic point of view, the cheapest drugs seem to work as well as the others.

DR. WILLIAM E. CALDWELL, NEW YORK, N. Y.—The careful preparation of a patient and the excellent technic during operation which Dr. Maxwell describes account in a large part for the few postoperative complications which she reports. In spite of the disagreeable and sometimes deleterious symptoms which follow the use of opium and its derivatives in the preoperative and postoperative care of patients, I am sure the majority of us have felt until now that we would be greatly handicapped were we deprived of their use. Though I have used small doses of allonal before operation, I have persisted in the use of morphine both before the anesthetic and for the first twenty-four hours after the operation. After the first day, luminal with codeine and allonal in much smaller doses than Dr. Maxwell advocates, have been used. Our results at the Sloane have been reasonably good but not so satisfactory as those Dr. Maxwell reports.

The restlessness and delirium which, as Dr. Maxwell points out, follow in some cases, as well as the swallowing of the tongue with resulting asphyxia, require constant and careful nursing as long as the effect of the drug lasts. Unfortunately, it is difficult in some clinics to give sufficient nursing care to watch these cases.

For the past ten months we have used pernocton in labor cases at Sloane. We have found it a very useful drug since it gives the patients sleep and amnesia without interference with uterine contractions. In fact, these are frequently much stronger and better after the use of the drug. We have found that small doses are very likely to be followed by restlessness, and that larger doses give better results. But, occasionally, serious delirium lasting for a few hours follows even when an adequate dose has been given. This occurred in six cases out of three hundred. We also had one patient die with bronchopneumonia a few hours after delivery where pernocton in very small doses had been used. Many of our cases had small doses of morphine preceding the pernocton by two to four hours before the barbituric preparation was given.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIF.—Dr. Maxwell's subject should be of interest to every surgeon because it represents work which is designed to save

nerve strain following surgery. I do not feel that surgeons, as a rule, have ever given proper attention to the mental distress which attends surgical procedures. There is nothing more distressing than to operate upon a patient for some anatomical lesion and see the patient become neurotic. If this paper accomplishes nothing more than to stimulate work along these lines, it will be well worth while. While these 500 laparotomies were developing, we used barbiturates in more than 900 cases. There were three deaths in the series and in none of them did the barbiturates play any part. This would suggest that the method is safe since three deaths in 500 major cases, more than half of which were hysterectomies, constitutes a very small mortality. I question whether delirium is the right term with reference to some cases, since the picture is one of disordered sleep and does not occur in all. Our recent observations suggest this represents an overdose of the drug. Nearly all patients wake up twenty-four to thirty-six hours after a period of complete amnesia.

The protection from nerve shock is the part of this postoperative treatment that appeals most strongly to me. There is no doubt, however, that the treatment lessens abdominal distention and diminishes the need for catheterization. These, in themselves, are more than worth while. One should remember, however, that morphine even if given only once increases the chance for abdominal distention.

DR. MAXWELL (closing).—This investigation was begun four years ago and while the body of the paper is concerned particularly with postoperative medication with barbituric acid hypnotics, within the last six months we have been using barbiturates as a preoperative adjunct to the anesthetic and have eliminated preoperative morphine. The results have been most satisfactory, the patient is tranquil and often asleep on entering the operating room, the induction of the anesthetic is facilitated and following the recovery from the postoperative hypnotics there is often complete oblivion of the entire operative procedure. The dosage has been controlled by body weight as I was unable to determine any relation between preoperative metabolic rate, blood-pressure readings, hemoglobin or other laboratory data and the postoperative reaction to the drug. The dosage, which is expressed in total dosage, was given over a 72 hour period so that at no time was an excessively large amount of the medication administered. Our recent experience with the most simple barbiturate, namely Barbitol ("Veronal") indicates that it compares most favorably with the most complex malynol-urea derivatives.

10. **The Induction of Labor. When Is It Indicated? Its Dangers and a Suggestion of a New Method of Procedure**, by Dr. Edmund B. Piper, Philadelphia, Pa. (This paper was read by title.)
11. **The Clinical Importance of Sex Hormones**, by Professor E. C. Dodds, London, England. (By invitation.) (See page 520, October issue.)
- 11-a. **The Use of an Anterior Pituitary Luteinizing Substance in the Treatment of Functional Uterine Bleeding**, by Drs. Emil Novak and Gerald B. Hurd (by invitation), Baltimore, Md. (Paper read by Dr. Novak.) (See page 501, October issue.)

DISCUSSION

DR. OTTO SCHWARZ, St. Louis, Mo.—With the discovery by Aschheim and Zondek of the presence of anterior pituitary hormones in the urine of pregnant women, the relationship of the anterior portion of the pituitary body to the ovary

was definitely brought to the attention of the gynecologists. The test for pregnancy which was developed by these workers seems to me of secondary importance to the great possibilities that this discovery might have on certain pathologic obstetric and gynecologic conditions. Important among these may be mentioned habitual abortion, amenorrhea, and functional bleeding. It is well known that in many cases of hyperplasia of the endometrium, with menorrhagia, there is abnormal development or absence of the corpus luteum. Therefore, it would seem logical that the anterior luteinizing hormone should probably be best used in these cases. Dr. Novak's results indicate definite progress in this field. It might be interesting to mention that Dr. Kelly of Atlanta, Georgia, in a recent article, states that he was able to produce the death of the fetus in utero and abortions by large doses of female sex hormone (oestrin) in guinea pigs. Corner (in 1929) by using alcoholic extracts of corpus luteum, was able to have pregnancy continue in animals from which the corpus luteum was removed. Recently Ehrhardt, of Frankfurt, transfused nonpregnant women with the blood of pregnant women. He was able to demonstrate from two to twenty hours after this, with the urine of these individuals, the same reactions in the test animal as with that from pregnant women. This would indicate that large amounts of hormones can be transferred in this way. This might be a rather practical way of giving this hormone unchanged, without the necessity of having extracts from urine or serum. I should like to know Dr. Novak's opinion concerning this and also in procuring urine for extraction, if he does not think it is better to have the material from cases under twelve weeks pregnant, because at this time the amount of oestrin present is rather insignificant.

DR. SAMUEL H. GEIST, NEW YORK, N. Y.—We too were much struck by the idea that Dr. Novak had, that anterior luteinizing hormone might have a beneficial effect on the bleeding cases and we have tried it in a series of cases over a period of four months. Before using it clinically, however, we attempted to find out whether this substance had any effect on the human ovary. In 22 cases we injected women who were to be subsequently operated upon for some pelvic condition where we would obtain both the uterus and the ovaries. We had in this series women who had been injected two or three times a day from one to thirteen days. The individual dosage varied. We experimented by trying in a way to duplicate the suggestion that Dr. Dodds has made. The women received as high as 1,400 units over a period of thirteen days. On examination of the ovaries we were much surprised and chagrined to find no gross or histologic changes. The uterine mucous membrane was also examined histologically and in four of the 22 there was a very distinct hyperplasia but it corresponded to the expected premenstrual phase. From the experimental point of view we were not led to believe that we would have much success in the treatment of the cases clinically. Yet in a series of 14 bleeding women 6 of them showed very prompt results from the administration of this anterior luteinizing hormone. We started with 50 units and repeated it twice daily for three days. In some instances we gave just one dose and repeated it every other day. In 6 of the cases there was a definite cessation of the bleeding. Unfortunately in three of them the bleeding recurred after several months. That is the present status of our investigation.

DR. ARTHUR H. CURTIS, CHICAGO, ILL.—Some years ago I gave empirically to women who had very bad vomiting of pregnancy, small transfusions of blood from pregnant women. Almost invariably it stopped the vomiting. I wonder whether possibly that may not be explained by the fact that pregnant women have this circulating luteinizing hormone and that pregnant women who have toxemia may not have a deficiency of that material?

DR. J. WHITRIDGE WILLIAMS, BALTIMORE, MD.—I am a skeptic and I am indeed very skeptical about curing pernicious vomiting by the injection of any substance whatever, because I can get the same result by simply talking to the patient and looking at her without injecting anything. Consequently I think evidence on that basis is very apt to be fallacious.

DR. ISIDOR C. RUBIN, NEW YORK, N. Y.—The absence of luteinization as shown by Dr. Geist in a series of human experiments suggests the possibility that the substance in the luteinizing hormone of the anterior pituitary exerts a styptic effect analogous to pituitrin. Because in order to prove a hormonal effect upon the uterus we must imagine a certain amount of cyclical change similar if not identical with the menstrual cycle. On the other hand, if 1 to 3 injections of this luteinizing hormone from the pituitary checks the bleeding, then we must assume that it must neutralize the antithrombin substance present in the endometrium and that it also checks the proteolytic substances supposed to be present in the mucosa. For a hormonal action in other words more time is apparently needed than a few days. It therefore seems to me that the substance used by Dr. Novak acts as a very prompt and effective styptic and hemostatic.

PROFESSOR DODDS (closing).—I feel that much more work must be done before the doctrines of two separate substances in the anterior pituitary can be accepted without reserve. Recent work has failed to separate Prolan A and B by the methods described by the original German workers. It would appear also that recent publications from this source are tending to indicate that there are greater difficulties attending the separation than the original workers at first suspected. It must also be remembered that there is an important group of workers who consider that the differences between follicle ripening and luteinization are regarded as merely quantitative phenomena. In other words, if one gives a small amount of the substance, ripening and hemorrhage will occur, and if one gives a large quantity, luteinization will occur. An interesting question will be when you can use progesterin itself and I think that this is not far distant. The interesting experiments of the German workers have shown that it will be possible to use this clinically.

DR. NOVAK (closing).—Professor Dodds lamented the fact that clinicians have shown much skepticism and conservatism in the use of ovarian follicle hormone. He discussed the work of Coward and Burus, and in my own paper I mentioned that of Marrian and Parkes, both of which indicate the inadequacy of the usual methods of using the follicle hormone.

Under any conditions whatsoever, and in any dosage whatever, can we bring about real menstruation with the follicle hormone? We cannot. At the best we can bring about in the endometrium a picture corresponding with estrus, and in a certain proportion of women we can bring about bleeding, but not menstruation. The bleeding of menstruation is an entirely different thing. The period of the human cycle which corresponds to estrus is at about the middle of the interval. Furthermore, the ovary is left untouched by the administration of folliculin. If the woman is satisfied to see a show of blood after hypodermic treatment with folliculin, there can be no objection to giving it, but we should not delude ourselves into thinking that we are producing a genuine menstruation, or that, in cases of sterility, we are doing anything to enhance the woman's chances of pregnancy.

In cases of functional amenorrhea it would seem rational to try to mimic what happens in the normal menstrual cycle of events. Under normal conditions there is a phase produced by folliculin, and this is followed by a secretory phase due to the progesterin produced by the corpus luteum. The ideal plan would, therefore, seem to be the administration of a series of follicle injections, followed by a

series of progestin injections, in an effort to imitate the normal cycle. Unfortunately, progestin is not yet available for human use, so that we have been giving in its place the anterior pituitary luteinizing hormone, which, as I have discussed, is apparently luteogenic. In short, our plan is to give, ordinarily, six daily injections from 50 to 100 R.U. each, and to follow this by four or five daily injections of from 1 to 200 R.U. of the luteinizing hormone. It may seem paradoxical that the latter substance is useful both in amenorrhea and in excessive bleeding, but a consideration of the facts which I have mentioned will, I think, convince us that this is not the case. Our results with this method of treatment of amenorrhea have been better than with any other which we have yet used.

Dr. Schwarz asked if the serum of pregnant women could not be used as readily as the anterior pituitary luteinizing hormone, which we have employed. I believe that it could, except that, with our preparation, we have a substance already prepared, standardized, and assayed, so that the dosage can be readily regulated. This would not apply to the serum of the pregnant woman, unless this were similarly prepared. Certainly the urine of pregnant women is a more convenient and readily available source than their blood.

Dr. Geist was fortunate in having had an opportunity to study the effect of the substance on the ovaries of a few cases. His results are just what I would expect, and confirm me in the impression that the effect on bleeding is not due to the histologic effect of the material, but to an effect upon some unknown bleeding factor.

Dr. Rubin suggests that the substance may be active because it is a good styptic. The definition of a styptic, I believe, is that it is an agent which stops bleeding. In this sense the luteinizing hormone is, of course, a styptic, but I believe that this effect is due to an endocrine influence. We have really become quite enthusiastic about the employment of this agent in cases of functional bleeding in younger women, and I believe it will save many of them from repeated curettage and radiotherapy.

DR. HUGO EHRENFEST, St. Louis, Mo.—Is it thought that estrin may prove useful in the growth of an infantile uterus?

DR. NOVAK.—Yes, I think so. It is a well-known fact that estrin has an effect on the musculature of the uterus, increasing its development, so that its use in cases of hyperplasia is rational.

PROFESSOR DODDS.—Dr. Novak says that the pituitary is the power behind the throne. Well, I think you always want to be sure that the throne is all right because the power behind it will not be much good if the throne is rocky. Are we sure that all these ovaries will respond to this treatment? I think that there may be a case where the ovary will not be capable of responding to the stimuli and I think we should keep estrin in mind.

12. The Pathology of Some Special Ovarian Tumors and Their Relation to Sex Characteristics, by Professor Robert Meyer, Berlin, Germany. (By invitation.) (See page 697, November issue.)

DISCUSSION

DR. EMIL NOVAK, BALTIMORE, MD.—The tumors which Dr. Meyer describes are, of course, very rare and I believe that some of Professor Meyer's own cases have been garnered from a retrospective study of his older material. We must all review and reappraise our old cases of ovarian tumors in the same way. Such a retrospective study, however, is sure to miss some points, as it would be only occasionally that one would find mention in our old cases of such features as changes in the voice of the patient.

With regard to the various types which he has presented, the first which he took up, the granulosa cell tumor, is of course the best known, and a considerable number of cases are being reported since the early publications of Meyer, Neuman, and Schiffman. The comparatively small group which we have observed in our own laboratory were reported last year, before this Society, by Dr. TeLinde. As has been shown, the histologic picture presents considerable variation. I have been much interested in Professor Meyer's explanation of the origin of these tumors, which he believes spring, not from mature follicles, but from the early oophorogenic apparatus of the ovary. As one reason for this belief he urges that ova have never been observed in these cases, even when the structure is definitely folliculoid; and, since the ovum is the dominating force behind the growth of the follicle epithelium, this fact precludes an origin from mature follicles. This argument, however, does not seem convincing to me, for, while the ovum may dominate the follicle epithelium under physiologic conditions, it is doubtful whether this would apply to the genuinely malignant epithelial overgrowth seen in these cases of granulosa cell cancer. Professor Meyer has had a far greater experience than anyone else with such tumors, and his theory may prove to be the correct one, but I do not believe that the question can be considered settled as yet.

With regard to the testicular adenomas which he described, and to which attention was called by Ludwig Pick, I should like to ask first of all whether he has seen any bilateral tumors of this type. Some time ago sections were sent to me by a colleague in Baltimore, from a bilateral tumor of papillomatous structure, apparently arising from the hilum of each ovary. Histologically I interpret this tumor as belonging to the general group of testicular adenomas. Here again Professor Meyer has stated his belief that the tumors arise from undifferentiated "anlagen" in the medulla of the ovaries, and that this undifferentiated tissue can take a direction along either male or female lines. It is a well-known fact that in certain hermaphrodites with fairly typical feminine sex characters only testicular tissue may be present. In view of the fact that the normal male testis is conceded to have an important internal secretion, it is not easy to understand why, according to Professor Meyer's view, undifferentiated tissue may exert a far greater effect upon sex character than well-formed testicular tissue. In most cases of this group, as Professor Meyer says, masculinization was not observed. It was not noted in the one case of our own which I mentioned above. The most interesting group which Professor Meyer described, however, are the arrhenoblastomas. It is safe to say that no such tumors are indexed, at least by this name, in any of our laboratories. Here as I have already stated, we must review our old tumors from this new standpoint. Just before I left Baltimore I examined the slides of a considerable number of ovarian tumors, and selected two which on histologic grounds seemed to correspond to this group, especially in that they showed a tendency to the definite tubal structure which Professor Meyer emphasizes. On going back to the histories I found that one had had an amenorrhea of eighteen months and the other of five months. Because of the limitations of such retrospective work it would be much more important to study our current tumors for the effect which they have on menstruation, development of the breasts, the distribution of hair, changes in voice, etc.

The study of these tumors leads one far afield, for it is inseparable from the questions of sex determination and differentiation, embryology, genetics, endocrinology and intersexuality, and, unfortunately, our knowledge of all these subjects is still very limited. For example, in the field of embryology, so distinguished an author as Fischel has recently published studies which throw doubt on the accepted belief that the germinal epithelium is the origin of the medullary columns, Pflueger's tubules, and the rete ovarii. He presents evidence which indicates that these structures are of mesenchymal origin.

Many years ago Virchow laid down the dictum: "*Propter ovarium mulier est quod est.*" (Because of her ovaries, woman is what she is.) Later Blair Bell modified this by saying, "*Propter secretiones totas mulier est quod est.*" (Because of all her internal secretions, woman is what she is.) This, likewise, has long since been found inadequate, and geneticists are now discussing sex differentiation and sex reversal in terms of chromosomes and even of the genes which make them up. Goldschmid, Halban, and others have made interesting observations on the questions of intersexuality and sex reversal. Geneticists, likewise, are performing apparent miracles in the matter of experimental sex reversal. An interesting case was recently reported by Crew, in which a hen, a mother of many chickens, began to assume the appearance and behavior of a rooster, and became the father of a number of chickens. In this case it was found that the one ovary (the left) had been completely destroyed by tuberculosis, and that the undifferentiated gonad of the opposite side had then developed as a testis. Many observations of this general type have now been made, and it is this experimental group which seems to have the most direct bearing upon the group of tumors described by Professor Meyer.

Finally, it should be emphasized that masculinization of the female patient is not infrequently found in the entire absence of ovarian tumors, and that, even where ovarian tumors are present, they need not necessarily be the cause of the endocrinopathy. For example, I have recently observed a patient who, following a childbirth five years ago, developed a heavy growth of hair over the face, so that she was obliged to shave every day, while there was also a heavy hairy growth over the breasts, abdomen, and lower extremities. In addition she had had an amenorrhea of many months. Incidentally there was present a left ovarian tumor, but this proved to be a simple serous cyst, and many sections have shown no evidence of any tissue comparable to that found in the genuine arrhenoblastoma. In this case, and in many others of like nature which have been reported the endocrinopathy is referable to the pituitary or to the suprarenal cortex.

The moral to be drawn from Professor Meyer's presentation is that we, as gynecologists, must study our ovarian tumors not only from the standpoint of their anatomy and histology, but also from the standpoint of their pathology and their biologic significance.

13. The Treatment of the Vertex Occipitoposterior Position, by Dr. Arthur H. Bill, Cleveland, O. (See page 615, October issue.)

DISCUSSION

DR. HILLIARD E. MILLER, NEW ORLEANS, LA.—I want to express an opinion considerably different in the handling of occipitoposterior positions. The first stage of labor in occipitoposterior positions should always be handled in the most conservative way. Only the unusual case necessitates any interference on the part of the obstetrician. Even though the bag of waters has ruptured at the beginning, or soon after the onset of labor, dilatation will usually occur satisfactorily if the character of the pains is good, and if the mother is assisted by the occasional small dose of morphine to guard against exhaustion. Once in a great while, where engagement is imperfect, a bag may have to be used to encourage full dilatation. I cannot condemn too strongly attempts to manually dilate the cervix.

Version serves a very definite purpose in occipitoposterior positions, but I believe its use should be limited strictly to those cases where dilatation has been completed, and where the occiput has not, or has only partially entered the brim. Even where partial engagement of the head has occurred, sufficient time should elapse to determine whether moulding will occur and allow of sufficient progress to terminate labor in a more conservative way.

Rotation of the head with forceps is a procedure which may be entirely safe in the hands of the expert, but this procedure is surely one which should not be advocated as the delivery of choice for the average physician, for many definite dangers are attendant upon this surgical maneuver. I personally have not rotated a head with forceps for several years. I still adhere to the plan of watchful waiting, and of permitting a sufficient amount of moulding of the head to occur to reduce the diameters that are attempting to deliver through the bony pelvis. Frequently a simple digital rotation of the head is possible if this moulding has occurred. Digital rotation is accomplished by inserting two fingers in the vagina, the forefinger encouraging or forcing flexion as much as possible, while the middle finger makes pressure against the overlapping parietal bone in the direction of the arc in which it is desired to rotate the head. Light anesthesia aids materially in this procedure. If rotation has been accomplished, the position is maintained until the patient has been able to fix the head in the new position by voluntary efforts. If it is not possible to rotate the head manually at this time, forceps are applied and the head is brought down to the perineum in a posterior position. Frequently, when it appears that the head will deliver in a posterior position, you are rewarded by the head rotating spontaneously to an anterior, and a simple delivery is accomplished. If this rotation does not occur, a wide episiotomy, bilateral if necessary, is done and the head is delivered as a posterior.

I believe a word in connection with the anesthesia to be used where version is elected would not be amiss. Complete surgical anesthesia is necessary for the elimination of all voluntary muscle reactions; the latter circumstance is most essential if we are to obviate many of the dangers of version. Ether serves this purpose in a highly satisfactory manner. I have not hesitated to do versions in instances where the membranes have been ruptured for hours, and even in cases where the uterus was more or less fairly contracted around the baby, if surgical anesthesia has been administered, and I have had no reason so far to regret the election of this method of delivery.

I was somewhat surprised to note that Dr. Bill reports 300 versions in his 500 cases of occipitoposterior positions, as this percentage runs considerably above that which occurs in my own private practice. My small percentage of versions is probably due to the fact that I still consider this procedure a major one, to be entrusted only to experts, and that it still carries a percentage of maternal and fetal morbidity which is too high to advocate lightly.

DR. JOHN O. POLAK, BROOKLYN, N. Y.—I differ with Dr. Bill definitely as to certain principles. As I see occipitoposteriors, they divide themselves very properly into those that will enter the brim of the pelvis and those that will not. There are a number of cases which will just dip in because of the size of the pelvis so that we would have very prolonged second stage and those are the cases where version is an extremely valuable procedure.

In regard to anesthesia in version, there is only one anesthetic that will give the relaxation necessary for version and that is chloroform. We can stop the chloroform immediately at the end of the version.

Dr. Bill's statement is interesting, that in the cases where the head will engage no time was given to the 172 cases to rotate in the pelvis. Now a large number of these cases would have rotated spontaneously and would have reached the pelvic floor. Of course, we understand that rotation does not take place until the head hits the pelvic floor. We give these cases time and we found recently in an analysis of 256 cases that rotation to the front unaided occurred in 97 per cent of our cases and our incidence of forceps were very much the same as the incidence of version.

DR. WILLIAM C. DANFORTH, EVANSTON, ILL.—I do not quite agree with Dr. Bill's operative indications. I recently analyzed a series of private patients numbering about 1,150. About 300 presented a posterior position, most of them being right. Of these only 70 required interference. It has been my experience, that a very considerable majority of posterior occiputs will spontaneously rotate and do not require operative interference, or at most an outlet forceps which is a much more simple procedure. Where interference is required when rotation does not occur spontaneously one should not wait for operative interference until the contraction ring has developed but one should wait until the head is definitely moulded into the pelvis in order that the smallest possible diameters are presented and also should the procedure for operative correction of the posterior position chance to disengage the head it may again easily enter. Then my choice would be a manual rotation which consists of going in with the whole hand and grasping the head with the fingers spread as far apart as possible, and by aiding with the outside hand on the posterior shoulder the occiput is brought to the front. This was done in 70 cases in which there was no fetal mortality. Should this fail, as it has in a small number of cases, we then proceed to version. Occasionally it is necessary to disengage the head. However, if the head has been allowed to mould into the pelvis this is a matter of no great moment except that the operator must look very carefully to see that the cord does not prolapse.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIF.—Dr. Bill's presentation shows me how trained men can approach problems in a different way and get approximately the same results. Recently in a study of 700 cases we became very much impressed with the fact that the first thing necessary for a successful normal labor is good labor pains. Our series show that nearly all of the occipitoposterior presentations which gave us difficulty had poor pains. Nearly all discussions on the treatment of vertex occipitoposterior hinge on the fact that birth with the occiput in the hollow of the sacrum is supposed to be difficult and carry considerable threat to both mother and child. Twenty per cent of our occipitoposterior series were delivered with the head in the hollow of the sacrum. The fetal mortality was 6 per cent, with no maternal deaths. In the series of 700 cases we had 3.4 per cent fetal mortality. Eighty per cent of the women with normal pelves were delivered either spontaneously or with low forceps whereas only 27 per cent of the women with abnormal pelves were delivered spontaneously.

The method of interference was of much interest to us as we reviewed our cases. There were 83 cases with poor pains. Only 34 of these were delivered by low forceps. This merely means, however, that the patient did not progress far enough in labor so that low forceps could be used, possibly because the pains were not sufficient to completely dilate the cervix and interference was demanded before the cervix was completely dilated by hand. For which reason, we had an unreasonably high proportion of high forceps in the women with poor pains. We only did six versions in the 700 cases.

The duration of labor is also of interest. Only 52 per cent of the series had labors of the length which are usually considered normal. Only 30 per cent of women with poor pains had labor of average length. Our study shows that when the patient does not have good pains, there is not likely to be either rotation or spontaneous labor, for which reason there is a high incident of operative interference no matter how one plans to treat his cases.

DR. COLLIN FOULKROD, PHILADELPHIA, PA.—The important points in this problem are I think the prolongation of the time of labor and the question of the relief of pain. Because statistics show that the midwife has fewer deaths and disasters than the physician we should not go back to the practice of fifty years ago and wait for every case to deliver itself as a midwife would do. It is not the time

limit of the labor that should concern us but whether the labor is progressing after one or two examinations. Those who allow the head to remain in the pelvis will have a higher percentage of deaths of babies and more edema and trauma at the time because edema and necrosis play a large part in healing, and are almost always present if the head stays in the pelvis for some time. Usually we are able to limit our interference to the use of low forceps. Personally I have never seen a case where I needed to do version.

DR. E. L. KING, NEW ORLEANS, LA.—I do not believe that we should set any time limit for interference. I think that the watching of the mother's condition and of the fetal heartbeat are the most important things. Personally I prefer to let the patient continue in labor as long as she is making progress and as long as the fetal heart tone is all right. The lower the head comes into the pelvis the easier the forceps delivery, or whatever type of delivery may be necessary. I have found, it is probably not original, that the multiparas will give us a much higher percentage of primary rotation than the primiparas.

I agree that the use of the bag at times in these improperly dilated cervixes with dry labor is very valuable and it is probably not employed as often as it should be. Cesarean section appears to me hardly to be indicated except in cases of contracted pelvis. Where the pelvis is normal and the head is not abnormally large I think it can be brought down by the forces of labor if the patient is given sufficient time. My policy in brief has been watchful waiting. I have not resorted to version because it always appears to me that these are unfavorable cases. My preference is the employment of forceps by the modified Scanzoni method. Sometimes I have used the DeLee method and sometimes the Kielland forceps. I have had cases where I have failed with the Scanzoni method and have been able to deliver them easily with the Kielland forceps; in others the Kielland has failed and the Scanzoni has worked. I have not been able to determine in most cases ahead of time which would be the more useful. I have not been in the habit of interfering as early as Dr. Bill does.

DR. WILLIAM E. CALDWELL, NEW YORK, N. Y.—Nothing has been said to-day of the various methods which have been found useful in preventing the dystocia due to occipitoposterior positions. In occipitoposterior positions the uterus is usually rotated in its long axis. A recognition of this fact and adequate manipulations will frequently correct the condition and the improved position of the uterus can be maintained by adequate supports either during the last few days of pregnancy or the first stage of labor. Dr. Watson has long advocated the use of a tightly folded towel under the anterior shoulder supported by tight binder or adhesive straps, and finds that in his own cases approximately 70 per cent of the babies rotate into one of the anterior positions.

I agree with Dr. Bill that the time to interfere with any dystocia is when the labor comes to a definite standstill, before the woman becomes exhausted and the child compromised. Frequently manipulating the child's head into the brim, increasing flexion or correcting the asynclitism by manipulations either with or without an anesthetic will allow the woman to deliver herself normally or simplify the operation. Weak irregular pains usually occur when the child's head, on account of the malposition, does not fit squarely into the axis of the pelvis or lower uterine segment.

I agree with Dr. Bill that a version and breech extraction is easier and safer than any forceps operation when the child's head is high in the pelvis, the cervix completely dilated and there is no bony obstruction. Occasionally a version is indicated even when the head is in the hollow of the sacrum when there is difficulty in rotating the child's head into an anterior position, but I agree with Dr. Danforth that in the vast majority of occipitoposterior positions, where the head has reached the plane of the greatest diameter in the hollow of the sacrum, the head can be

rotated safely and easily by hand, though the manipulation advocated by Dr. Bill with forceps is useful in such cases.

In cases of version and breech extraction, broken necks can be prevented by splinting the neck with a large finger against the occiput, preventing the angulations at the fifth, sixth or seventh cervical vertebrae where most of these fractures occur. The large number of broken necks which we were shocked to find when we began to do routine autopsies on all our stillbirths has been reduced to a very occasional case by this manipulation.

I would urge the less skillful or occasional obstetrician to follow the more conservative policy, and that by following such a routine he will find it necessary to do very few versions or difficult forceps.

DR. HUGO EHRENFEST, St. Louis, Mo.—I am surprised that in this discussion of treatment the fact has not been mentioned that there is a possibility of actually preventing this unfavorable posterior rotation. I was taught very many years ago that the occipitoposterior rotation has a great deal to do with incomplete flexion and I still believe this to be correct. I am convinced that a successful effort to increase flexion will prevent posterior rotation, will cause the head to rotate normally. It always has been my practice, whenever the head is slow entering the pelvis, to keep the patient during labor lying on the side on which is the fetal back. Usually it will be the right. The uterine fundus then slips over to this side and the uterine contraction force is more directly transmitted to the occiput. This favors further flexion. I do not believe that watchful waiting alone is sufficient.

Also in the attempt at manual correction of posterior rotation of the head deeper in the pelvis, further flexion must be achieved by placing the hand over the occiput and pulling it downward. From merely a statistical point of view I find difficulty in agreeing with Dr. Bill's assertion that in his 500 cases the operative correction was necessary because rotation would not have occurred spontaneously. I think that the incidence of birth in persistent posterior rotation amounts to approximately 1 in 100. How large was the total number of deliveries to account for 500 such cases?

DR. J. R. GOODALL, MONTREAL, CANADA.—Cases of occipitoposterior positions may be divided into those in which the membranes remain intact throughout the first and part of the second stage, and those in which the membranes rupture early in the first stage of labor.

The first group of cases, when progress ceases, may be remedied by any of the many procedures that are recommended for this condition. Frequently, merely tilting the brow up suffices. In others manual rotation does the trick. Failing this, the Pomeroy maneuver will be found successful in a percentage of cases, and lastly, forceps rotation is usually very simple. But the problem is a very different one in the second group of cases. The head has so elongated by both caput and moulding that manual change of the flexion becomes an impossibility. The complete draining away of the waters does not permit of a Pomeroy maneuver, and the shoulder becomes so incarcerated by the retracted uterus that it also becomes a factor in retarding or arresting rotation.

Under these circumstances one has to resort to a double application of forceps as offering the best chances of delivery. I consider it a mistake to apply the term Scanzoni to the method described by Dr. Bill. I have reviewed Scanzoni's original article and find that he never intended that the forceps should be used as a rotator. My method consists in applying the instruments to the head in the French method, applying traction and allowing the head to rotate as it will, either anteriorly or posteriorly, without endeavoring to rotate.

DR. BILL (closing).—As to the number of versions performed, I was myself surprised when I saw I had done so many versions. I never decide what I am going to do in advance. I decide on the procedure after the patient is scrubbed up and

ready for delivery. I never do a high forceps and if the head is high and is suitable for a version I do a version. It happens that I am doing more versions than formerly. That means that forceps deliveries were easy deliveries. I have eliminated from my work the difficult forceps.

As to the rotation and damage that may be done, that is considerably exaggerated. It is all a question of technic. I can see nothing in the procedure which I described which could possibly tear the vaginal wall or damage either the mother or child. Such damage is done when the head is drawn down in the posterior position, which is abnormal, or when traction is made along with the rotation. I never make any traction on the head when it is posterior, nor when it is rotating, but the rotation is done in the station in which the head lies. That is the secret, I think, of the whole thing.

As to waiting, the damage was done in my series by waiting. Four of the fetal deaths were due to waiting. Only one could have been possibly attributed to interference. The time when one can perform these deliveries most safely for both mother and child is early, before there is fetal distress and before the mother is exhausted.

What are we thinking of in reference to an obstetric case? Are we thinking of a possible though doubtful mechanism or of saving the patient's energy by relieving her of four to seven hours of labor in the second stage by correcting the abnormality in a comparatively few minutes? Our results are always better with early interference.

We all know that the cases which we see in consultation are the difficult ones, and they are the cases in which there has been a long second stage before we are called in. The head is harder to rotate, but it can be rotated. There has often been severe traction on the head in the posterior position with no advance and with slipping of the blades. The diagnosis of a posterior position may not have been made by the attending physician. In such cases, rotation of the head often makes the delivery extremely easy, if the abnormality is corrected.

PHILADELPHIA OBSTETRICAL SOCIETY

STATED MEETING, FEBRUARY 5, 1931

DR. MORRIS FRANKLIN read a paper entitled **Clinical Observations on the Etiology of Icterus Neonatorum**. (For original article see page 913.)

DR. FRIEDA BAUMAN presented a case report of **Ulcerative Colitis Complicated by Pregnancy**.

S. M., a young woman, twenty-nine years of age, requested a physical examination preparatory to a hemorrhoidectomy.

Chief complaint of six months' duration was blood in the stools and at times painful defecation. She had two to five evacuations daily, one of which was usually a firm, slightly constipated stool which always gave pain. The others contained very little fecal matter, but free blood or blood, mucus, and pus. The only other symptoms were easy fatigue, slight dyspnea on exertion, and a very slight loss of weight.

The important facts in the past history were: Influenza in 1918 and so-called intestinal influenza, first diagnosed as typhoid fever, in 1929. At this time the patient was ill sixteen days and ran an irregular temperature of the remittent type. The maximum temperature was 104° and returned to normal by lysis by the tenth day. The spleen was palpable and the patient had a leucopenia.

The significant positive physical findings were as follows: The patient was a moderately well-nourished, well-developed, white woman. The skin was rather white and waxy. The hairy growth was scant, suggesting the status lymphaticus type. The blood pressure was 98/64, pulse 90, hemoglobin 48 per cent, red blood cells 2,980,000, and white blood cells 3,800, and lymphocytes 53 per cent.

A proctoscopic examination resulted in a provisional diagnosis of ulcerative colitis of unknown origin. X-ray findings corroborated this.

Bacteriologic examinations were made of the stools and smears taken directly from the ulcers. Numerous cultures revealed the diplostreptococcus corresponding to the Bargaen organism. The growth was plentiful. The patient's serum and bacterial cultures agglutinated in dilutions up to 1/60 and 1/40 with cultures obtained from the Mayo Clinic and from another patient in which the Bargaen organism had been identified. All the tests for the typhoid group, *B. melitensis* and *abortus*, tubercle bacilli, and the bacillary dysentery group were negative. On two occasions encysted bodies suggestive of entameba were found. Dr. Berta M. Meine who had done the laboratory studies did not consider these ameba histolytica. Dr. Diller of the Department of Parasitology at the University of Pennsylvania identified them as *trichomonas* and *chilomastix*. These were considered nonpathogenic.

At the end of a month of autogenous vaccine treatment and careful dietary régime the patient's hemoglobin was 65 per cent and the red blood cell count was 3,990,000, and the temperature was normal. The patient was then placed under the care of her local, private physician to continue treatment.

The patient consulted me three months later when she stated about a month previous a diagnosis of two months' pregnancy had been made. Mild symptoms of nausea of pregnancy had been treated and easily controlled. The hemoglobin was 42 per cent and the red blood cell count 3,350,000.

At this time the question of a therapeutic abortion was discussed and largely because of the patient's strong objection to interference it was decided not to interrupt the pregnancy but to use blood transfusions in the early months of pregnancy, beginning immediately. This was done with a resulting hemoglobin of 70 per cent and a red blood cell count of 3,660,000.

Two months later, in the fifth month of pregnancy, following a slight rhinitis with chilly sensations and a temperature of 99.2°, the patient had an acute onset of diarrhea, ten to fifteen stools a day, and also some nausea and vomiting. The leucocyte count was 10,050.

The symptoms rapidly became worse and the patient developed signs of toxic nephritis and acidosis. Thirteen days after this acute onset, the patient died.

At no time during her illness, either before or after pregnancy, had there been any signs of nephritis or toxemia of pregnancy. The urinary and blood chemistry findings were constantly negative. The blood pressure remained low.

The postmortem done by Dr. Meine gave as the chief finding a diffuse ulcerative colitis. The ulcers were irregular, hemorrhagic, gouged, and some were circinate. Dispersed among these were many small, punctate, pin-point ulcers. The lesions were confined to the colon. The small intestines were entirely free. The kidney showed an acute nephritis.

It was concluded that if the Bargaen organism was not the etiologic factor in causing the colitis, it was at least a definite secondary factor superimposed on some other cause which we were unable at any time to detect.

DR. CHARLES S. BARNES AND DR. HELEN M. HAYES presented a paper entitled **Ulcerative Colitis Complicating Pregnancy and the Puerperium**. (For original article see page 907.)

DISCUSSION

DR. FRANK W. KONZELMAN (by invitation).—From the standpoint of the pathologist, the etiology of this condition is of the utmost interest. It is easy to understand that colitis in pregnancy may be divided into two main groups; first, the toxic group, including eclampsia, uremia and cases of chemical poisoning. It is well known that in uremia the mucosa of the colon is frequently damaged, presumably in its effort to excrete the toxins normally excreted by the kidney. In either of the above-named conditions, after toxic injury, the intestinal mucosa may be attacked by the organisms normally found in the lumen, and because they are recovered from smears or cultures from the feces, it is often incorrectly assumed that these organisms are the prime etiologic factors.

Second, the parasitic group, including amebic colitis and bacillary dysentery, typhoid fever and other acute and chronic infections, such as pyemia.

Ordinarily, the first two present no difficulties in diagnosis. With acute infections such as pyemia, as seen in puerperal sepsis, the streptococcus often is directly responsible for the intestinal lesion.

Among the chronic infections, which are by far the most interesting, we find a variety of organisms. Bagen has described a streptococcus morphologically similar to the enterococcus but differing in its serologic reactions. The enterococcus itself is occasionally found. Some observers have found an organism resembling pneumococcus.

In the cases cited, the first and fourth undoubtedly fall into this last group. The first case gave a uremic history and closely resembled one of our cases at Temple University. In the latter, an elongated encapsulated streptococcus was found in the intestinal mucosa which resembled, at least morphologically, the one described by Bagen.

From the facts presented, one is justified in assuming that there occur in pregnancy cases of colitis in which a definite organism is demonstrable, and that this organism is an elongated, encapsulated diplococcus. Whether it represents a single type or whether there are many varieties of organisms presenting this peculiar morphology, is yet to be learned. Certainly, all cases of colitis occurring in pregnancy should be studied bacteriologically either by making cultures of the stools, or when possible, by direct smears from the mucosa of the lower bowel, and careful cultural phenomena, as well as serologic reactions, should be determined with the organism in each case.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, DECEMBER 19, 1930

DR. JAMES B. HERRICK presented a **Memorial Tribute to the Late Dr. Charles E. Paddock**, a member of the Society.

DR. ALEXANDER G. GABRIELIANZ presented a paper on **Spinal Anesthesia in Gynecology**.

DR. J. P. GREENHILL described **Rupture of a Corpus Luteum With Intraabdominal Hemorrhage** and presented a **Report of Three Cases**. (See page 902.)

DISCUSSION

DR. E. W. FISCHMANN.—I have encountered two cases. The first was a white woman, thirty years old, who was admitted to the medical ward of Cook County Hospital in 1923 after having collapsed in a doctor's office following bimanual examination. When I saw her she had the cardinal symptoms of intraabdominal hemorrhage. The diagnosis was ruptured ectopic pregnancy. At operation free blood was found in the peritoneal cavity together with a ruptured corpus luteum. She made an uneventful recovery. The other case was that of a girl, aged 15 years, in whom I had made a diagnosis of acute appendicitis. At operation I found intraabdominal hemorrhage due to a ruptured corpus luteum. Undoubtedly the condition is far more frequent than the literature would lead us to believe.

DR. MARK T. GOLDSTINE.—Dr. Greenhill's three cases are not cases of acute rupture from the description he gives. I cannot understand why he would have any greater difficulty in diagnosing rupture of an ovarian cyst with large hemorrhage than he would have in diagnosing large hemorrhage from ruptured ectopic pregnancy. These cases are not uncommon. We have had several at Wesley Memorial Hospital.

DR. H. O. JONES.—This condition occurs very frequently. In my association with Dr. Watkins and Dr. Curtis I have seen it forty or fifty times. We have always felt that if you leave these patients alone under observation until something more definite in the way of symptoms develops that the necessity for surgical operation will be obviated.

DR. R. A. LIFVENDAHL.—Recently I had a case in which the diagnosis was made preoperatively. The young girl came to the hospital complaining of lower abdominal pain which came on four days after her last menstrual period for one or two days. She had a slight amount of nausea after eating. There were no evidences of pregnancy. There was a mass on the right side, a typical cyst. The diagnosis was ruptured corpus hemorrhagicum. She was kept in bed for twelve hours, during which time she vomited on three different occasions. On opening the abdomen there was a moderate amount of blood in the pelvis. In the right ovary there was a large egg-sized cyst containing a large corpus hemorrhagicum, on the surface of which was a rupture. The tubes were slightly thickened but showed no evidence of chronic pathology.

When the patient entered the examining room, I noted a slight red rash on the neck and chest. She stated that though she had never had rheumatism, during the preceding ten days every joint in her body ached. I felt that with such evidence of serum reaction I was justified in making a diagnosis of blood in the peritoneal cavity.

Does the position of the corpus luteum predispose it to an excessive amount of hemorrhage? I would like to know whether the surrounding ovarian tissue shows any pathologic changes. One other theoretical question is whether there is any explanation with regard to a possible drop in the platelet count during menstruation which would predispose to an increased amount of bleeding in the cyst, and is there an increase in the permeability of the vessels of the ovary at this time?

DR. RALPH REIS.—I wish to report a case that occurred in a patient fourteen weeks pregnant, who suddenly developed acute abdominal pain while eating dinner. In the course of two or three hours she developed the clinical picture of acute intraabdominal hemorrhage of rather massive quantity. Her hemoglobin dropped from 80 to 50 and the red cell count from 4,500,000 to 3,000,000. At operation the peritoneal cavity was found to be filled with huge fresh clots and a small corpus luteum in the left ovary. This patient miscarried on the sixth day postoperative. Both tubes were normal and there was no decidual reaction in the tubes and nothing to point toward an ectopic pregnancy.

DR. FREDERICK FALLS.—I have under observation at the present time a young woman, twenty-four years of age. An internist thought she had acute appendicitis and asked me to see her. On vaginal examination I felt some thickening of the tube and ovary on the right side and a good deal of tenderness. There were no symptoms of shock. There was a high leucocytosis and right rectus rigidity. We believed the diagnosis of appendicitis was correct and suggested, because of the tenderness of the tube and ovary on the right side, that the appendix might be in the region of the tube and ovary. The patient was operated upon by another surgeon, who found a small amount of free blood and a normal appendix. A diagnosis of ruptured ovarian cyst was made. The appendix was removed and the abdomen closed. The patient did not do well. She had pain on the left side and at the present time she has what is apparently the same thing on the left side. The ovary is as large as a golf ball, but has not ruptured. The question is whether we should operate or leave her alone.

DR. GREENHILL (closing).—I should have said that this condition is not at all uncommon; we see it frequently. In reference to the syndrome that both Dr. Falls and Dr. Lifvendahl mentioned, young individuals presenting a picture similar to this should not be operated upon. I have frequently seen young women with more or less typical attacks of appendicitis. At operation a normal appendix is found but something wrong with the ovary. I think those patients should be left alone.

I cannot answer Dr. Lifvendahl's question about the anatomy. Concerning the ovarian tissue surrounding the cysts, only two of my patients were examined histologically. In those the ovarian tissue was very normal except that in one case there was hardly any ovarian tissue. This patient had 400 c.c. of blood in the abdomen. I do not know enough about the platelet count in menstruation to say whether that is a factor.

Dr. Bacon asked about the origin of these cysts. Two were corpus lutea proper and one a corpus luteum cyst. They were not endometriomas.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, JANUARY 16, 1931

DR. WILLIAM McL. THOMPSON presented a paper entitled **Endometriosis of the Umbilicus**. (See page 917.)

ABSTRACT OF DISCUSSION

DR. CAREY CULBERTSON.—This case presents all the characteristics of endometriosis, not only the tubules but the characteristic stroma. It seems to me the possession of stroma is quite as important as tubules.

DR. FREDERICK H. FALLS presented a paper entitled **Observations on the Use of Lugol's Solution in Hyperemesis Gravidarum**. (See page 882.)

DISCUSSION

DR. S. J. FOGELSON.—I wonder whether Dr. Falls has ever seen cases of toxic thyroid in which pregnancy has failed to cause hyperemesis at any time. It is well known that toxic thyroid patients cannot be held for eight or nine months by the administration of Lugol's solution. Here are cases in which Lugol's has been given over long periods and still the thyroid symptoms are apparently controlled. I think Dr. Carlson demonstrated that Lugol's intravenously stopped peristalsis in the stomach and upper bowel. This particular phenomenon may be what has controlled our patients up to this time.

DR. FALLS (closing).—We have seen hyperthyroidism without vomiting. We have a number of cases, 50 per cent of which we can classify as real hyperthyroidism, that have had Lugol's solution over a long period. A thing that has surprised me is this: We were told that if one operated on a thyroid after the benefit of the Lugol's solution had passed, the patient would go into crisis and die. That did not happen. This suggests that the condition called hyperthyroidism in pregnancy is different from that occurring in the nonpregnant individual.

DR. R. M. GRIER presented a study of **Fetal Mortality**. (See page 890.)

DISCUSSION

DR. DAVID S. HILLS.—I would like to ask Dr. Grier whether the policy in breech cases is to extract the breech when the cervix is dilated, or to obtain spontaneous delivery if possible. He does not mention infarction of the placenta in the causes of death in toxemia cases. I think it is a rather frequent cause of fetal death in those cases which we try to carry on.

DR. F. L. ADAIR.—There are two or three points that should be cleared up before any conclusions are drawn relative to the comparative safety of low forceps and spontaneous delivery. In the first place, probably forceps would not be applied to monsters. I think that group should be excluded. Again probably forceps would not be used on a dead baby with the head at the perineum.

DR. W. C. DANFORTH.—This paper emphasizes one thing, that one of the greatest causes of death is traumatic cerebral hemorrhage. That should be always in our minds in dealing with these cases and should influence our technic and choice of operation. A poorly executed operation or a poorly chosen operation could be very likely followed by injury to the child's cranial contents and hemorrhage.

It is interesting to see the favorable results from carefully carried out forceps delivery. I agree with a number of others who have expressed an opinion that the use of forceps in a well managed maternity should be considered as conservative rather than radical. Most of us get better results from the procedures we are thoroughly familiar with. For instance, manual rotation in occiput posterior positions in preference to forceps rotation has given us better results than version and extraction, which we reserve for the occasional case in which manual rotation and forceps do not suffice.

DR. N. S. HEANEY.—The one point that interests me particularly is the high mortality in the cases of version and extraction. I would like to have some advocates of version and extraction say a few words about it. From the experience I have had, I would issue a word of warning to the younger men who have not done many cases of version and extraction, that probably as their experience grows they will give it up.

DR. GRIER (closing).—Answering Dr. Hillis' question, we always try to let the woman push the breech down and out of the vagina, although in many cases we have interfered before that time. These figures are going to be a lesson to us and we shall try to be more conservative about the delivery of the breech.

As far as infarcts of the placenta are concerned, there are a large number of cases of infarct, but the reports are not very complete as to the extent of the infarction. In many cases the cause of death was apparently something else.

The figures in low forceps show that it is not a very dangerous procedure. It seems that we are all becoming skeptical about the use of version and extraction because the mortality is high.

INDEX TO VOLUME XXII

AUTHORS INDEX*

A

- ACOSTA-SISON, HONORIA, A clinicopathologic study of eclampsia based upon thirty-eight autopsied cases, 35
- ADAIR, FRED L., Pediatric education, 650 (Editorial Comment)
- , Standards of prenatal care, 458
- ANDRUSSIER, ISAAC, (WITH MAZER, CHARLES), The incidence, diagnosis, and treatment of functional sterility, 46
- ANSPACH, BROOKE M., AND HOFFMAN, JACOB, Perforating chorionepithelioma of the uterus with free intraperitoneal hemorrhage, 239, 321
- , and —, Primary carcinoma of the fallopian tube, with a report of two cases, 424

B

- BALDWIN, L. GRANT, Baldwin modification of the Jarcho pressometer for transuterine insufflation, pneumoperitoneum and uterosalpingotomy, 783
- BARNES, CHARLES S., AND HAYES, HELEN M., Ulcerative colitis complicating pregnancy and the puerperium, 907, 946
- BAUMAN, FRIEDA, Ulcerative colitis complicated by pregnancy, 944
- BEAR, JOSEPH, Infencephalus, with the report of a case, 429
- BILL, ARTHUR H., The treatment of the vertex occipitoposterior position, 615, 939
- BROWN, HERMAN, (WITH KLAUDER, JOSEPH V.), Study of the calcium-phosphorus ratio in the serum of syphilitic pregnant women, 60, 120
- BROWN, RADFORD, Tuberculosis of the corpus uteri without involvement of the endometrium, 225, 319
- , MOLOY, HOWARD, AND LAIRD, MARIAN, Pernoeton as an analgesic in obstetrics and gynecology, 225
- BURWELL, W. KEITH, A study of five hundred blood transfusions, 261

C

- CALKINS, L. A., LITZENBERG, J. C., AND PLASS, E. D., The length of labor, 604
- COPE, ELIZABETH J., (WITH STEIN, IRVING F.), *Trichomonas vaginalis* (Donné), a preliminary study, 368, 445
- CORNELL, EDWARD L., GOODMAN, L. J., MATTHIES, MABEL M., The culture incidence and treatment of *trichomonas vaginalis*, 360, 445
- CORNER, GEORGE W., The function of the corpus luteum, 125
- , (WITH WILSON, KARL M.), The results of the rabbit ovulation test in the diagnosis of pregnancy, 513
- CORSCADEN, JAMES A., Anatomical changes subsequent to the radiotherapeutic treatment of benign uterine conditions, 74
- COSGROVE, S. A., Nupercaine subdurally in obstetrics, 763

- CROSSEN, H. S., Conclusions from a study of five-year cures in a series of 121 cases of carcinoma of the cervix uteri, 559

D

- DAY, HILBERT F., Treatment of forceps marks in the newborn, 336 (Correspondence)
- DENNEN, EDWARD H., A new forceps with a traction curve, 258, 319
- DIECKMANN, WILLIAM J., Gum acacia in the treatment of eclampsia, 351
- DI PALMA, SALVATORE, (WITH RICCI, JAMES V.), Analysis of 100 cases of ruptured ectopic gestation: technic and evaluation of auto-hemofusion, 857
- DODDS, E. C., The clinical importance of sex hormones, 521, 934
- DOUGLASS, MARION, Reconstruction of the urethra and vesical sphincter by employing the levator ani muscles, 739
- DRAKIN, CHARLES, (WITH SCHWARZ, OTTO H.), Basal metabolic rates in late pregnancy and the puerperium, 571

E

- EASTMAN, NICHOLSON J., The nature of urinary protein in eclampsia, 756
- EVERETT, H. S., Probable tubal origin of endometriosis, 1

F

- FALLS, FREDERICK H., Observations in the use of Lugol's solution in hyperemesis gravidarum, 882, 949
- , AND JAFFE, RICHARD H., Intestinal obstruction in the newborn due to mucous plug, 409
- FARRAR, LILIAN K. P., (with Ward, George Gray), Reradiations in the radium therapy of carcinoma of the cervix uteri, 543
- FEINER, DAVID, Placenta accreta. Clinical consideration, pathology and management, 312
- FLEISCHER, ABRAHAM J., Thyrotoxicosis complicated by pregnancy, 273
- FLUHMAN, C. F., The interrelationship of the anterior hypophysis and the ovaries. 2. Further advances (June, 1929—June, 1931), 803 (Collective Review)
- FRANK, ROBERT T., Fatal uremia due to complete prolapse of the uterus, 270
- FRANKLIN, MORRIS, Clinical observations on the etiology of icterus neonatorum, 913

G

- GRIST, SAMUEL H., The morphology of menstrual blood and its diagnostic value, 532
- GELHORN, GEORGE, Pelvic diathermy, 297
- GOODMAN, L. J., (WITH CORNELL, EDWARD L., AND MATTHIES, MABEL M.), The culture, incidence and treatment of *trichomonas vaginalis*, 360, 445
- GORDON, ONSLOW A., JR., The surgical indication in eclampsia, 97, 122
- GRAVES, WILLIAM P., The unification of science and its relation to the control of life, 341

*July, pp. 1-172; August, pp. 173-340; September, pp. 341-500; October, pp. 501-660; November, pp. 661-816; December, pp. 817-950.

- GREENHILL, J. P., Krukenberg tumor, 445
 —, Rupture of a corpus luteum with intraabdominal hemorrhage. Report of three cases, 902, 947
 —, The obstetric literature of 1930, 141 (Collective Review)
- GRIER, ROBERT M., Fetal mortality. A study of 225 consecutive fetal deaths in a series of 4,668 deliveries, 890, 949
- GURNEE, W. S.; (WITH HOLDEN, FREDERICK C.), The Elliott treatment, a new method of applying vaginal heat, 87
- H
- HAMMOND, FRANK C., Abdominal operations during pregnancy, with the report of three cases, 878
- HARRIMAN, WALTER F., Pediculated cystic fibromyoma arising from the fundus uteri removed postpartum, 113
- HARTMAN, CARL G., (WITH IVY, A. C., AND KOFF, ARTHUR), The contractions of the monkey uterus at term, 388
- HAYES, HELEN M., (WITH BARNES, CHARLES S.), Ulcerative colitis complicating pregnancy and the puerperium, 907, 946
- HILLIS, DAVID S., The diagnosis of contracted pelvis by the impression method, 449
- HOFFMAN, JACOB, The effect of anterior hypophyseal implants upon senile ovaries of mice, 231, 320
 —, (WITH ANSPACH, BROOKE M.), Perforating chorionepithelioma of the uterus with free intraperitoneal hemorrhage, 239, 321
 —, (WITH ANSPACH, BROOKE M.), Primary carcinoma of the fallopian tube, with a report of two cases, 424
- HOLDEN, F. C., Adenomyoma of the uterus, 799
 —, AND GURNEE, W. S., The Elliott treatment, a new method of applying vaginal heat, 87
- HOLT, HELEN, (WITH MOENCH, G. L.), Sperm morphology in relation to fertility, 199
- HURD, GERALD B., (WITH NOVAK, EMIL), The use of an anterior pituitary luteinizing substance in the treatment of functional uterine bleeding, 501, 934
- I
- ILL, CARL H., An analysis of obstetric work done in Essex County, N. J., hospitals for the years 1927, 1928, 1929, 129
- IRVING, FREDERICK C., AND KELLOGG, FOSTER S., Two additional cases of acute puerperal inversion of the uterus treated by abdominal replacement, 440
- IVY, A. C., HARTMAN, CARL G., AND KOFF, ARTHUR, The contractions of the monkey uterus at term, 388
- J
- JAFFE, RICHARD H., (WITH FALLS, FREDERICK H.), Intestinal obstruction in the newborn due to mucous plug, 409
- JOHNSON, W. O., Two years' résumé of abortions in the Louisville City Hospital, 778
- K
- KAHN, ISADOR W., A new demonstration evpeece for teaching cystoscopy, 926
- KASMAN, LOUIS P., Sarcoma of the uterus, 767
- KELLOGG, FOSTER S., (WITH IRVING, FREDERICK C.), Two additional cases of acute puerperal inversion of the uterus treated by abdominal replacement, 440
- KLAUDER, JOSEPH V., AND BROWN, HERMANN, Study of the calcium-phosphorus ratio in the serum of syphilitic pregnant women, 60, 120
- KOFF, ARTHUR (WITH IVY, A. C., AND HARTMAN, CARL G.), The contractions of the monkey uterus at term, 388
- KORNFELD, GEORGE, The conservative treatment of ablatio placentae, 101, 121
- KOSMAK, GEORGE W., The responsibility of the medical profession in the mortality from childbearing, 748, 928
- KRUMM, JOHN F., Congenital hernia of umbilical cord with eventration and absence of a sac, 442
- KUSHNER, J. IRVING, A case of rudimentary congenital heart in newborn, 647
- L
- LACKNER, JULIUS E., (WITH SCHOCHET, SYDNEY S.), A review of the gynecologic literature of 1930, 326, 477 (Collective Review)
- LAFERTY, JOHN M., The blood sugar in eclampsia, 637
- LANGLOIS, LEO J., (WITH MORRIS, HAROLD L.), Urinary tract infections during pregnancy, 211
- LAIRD, MARIAN, (WITH BROWN, RADFORD, AND MOLOY, HOWARD), Pernocton as an analgesic in obstetrics and gynecology, 225
- LEFF, MORRIS, Hemorrhage from a ruptured varicosity in the placenta causing the death of the fetus, 117
 —, Rigor mortis of fetus causing obstruction in delivery, with the report of a case, 317
- LIFVENDAHL, RICHARD, A vaginal speculum for euterization of the cervix, 444
- LITZENBERG, J. C., (WITH CALKINS, L. A., AND PLASS, E. D.), Length of labor, 604
- LYNCH, FRANK W., A five- to fifteen-year follow-up study of one hundred ninety-two cervical cancers, 550
- M
- MCCALLA, L. H., A cervical dilator, 428
- MAGID, M. O., The position of the uterus based on a study of spinal-pelvic relationship, 281
- MANN, BERNARD, Acute lymphatic leukemia complicating pregnancy, 416
- MASSON, JAMES C., Prevention and repair of hernia in low median-line incisions, 596
- MATTHEWS, HARVEY BURLISON, In memoriam, John Osborn Polak, 174
- MATTHIES, MABEL M., (WITH CORNELL, EDWARD L., AND GOODMAN, L. J.), The culture incidence and treatment of trichomonas vaginalis, 360, 445
- MAZER, CHARLES, AND ANDRUSSIER, ISAAC, The incidence, diagnosis and treatment of functional sterility, 46
- MAXWELL, ALICE F., Clinical study of postoperative value of barbituric acid hypnotics, 579, 933
- MAZZOLA, VINCENT P., (WITH POLAK, JOHN OSBORN, AND ZWEIBEL, LEONARD), The value of hypertonic glucose therapy in pre- and post-operative conditions, 817

- MEAGHER, WILLIAM C., A case of large teratoma of ovary, first noted eight years after menopause, 454
- MEAKER, SAMUEL R., Leiomyosarcoma of the uterus, with a report of four personal cases, 400, 451
- MEYER, ROBERT, The pathology of some special ovarian tumors and their relation to sex characteristics, 697, 937
- MOENCH, G. L., AND HOLT, HELEN, Sperm morphology in relation to fertility, 199
- MOENCH, L. MARY, Primary epithelioma of the vagina, 837
- MOLOY, HOWARD, (WITH BROWN, RADFORD, AND LAIRD, MARIAN), Pernoxon as an analgesic in obstetrics and gynecology, 225
- MORRIS, HAROLD L., AND LANGLOIS, LEO J., Urinary tract infections during pregnancy, 211

N

- NOVAK, EMIL, Pelvic endometriosis. Spontaneous rupture of endometrial cysts, with a report of three cases, 826
- , AND HURD, GERALD B., The use of an anterior pituitary luteinizing substance in the treatment of functional uterine bleeding, 501, 934

P

- PECKHAM, C. H., (WITH STANDER, H. J.), Prognosis in nephritis complicating pregnancy, 626
- PHILLIPS, LYLE G., Parotid swelling associated with lactation, with the report of a case, 434
- PIERCE, JAMES M., Transplantation of an ureter into the sigmoid in a patient whose other kidney was functionless. Primary recovery, 438
- PLASS, E. D., The relation of forceps and cesarean section to maternal and infant morbidity and mortality, 176
- , (WITH CALKINS, L. A., AND LITZENBERG, J. C.), The length of labor, 604
- POLAK, JOHN OSBORN, MAZZOLA, VINCENT P., AND ZWEIBEL, LEONARD, The value of hypertonic glucose therapy in pre- and postoperative conditions, 817

R

- REYCRAFT, J. L., Meningo encephalocele with microcrania, 433
- RICCI, JAMES V., The differential diagnosis of acute initial salpingitis and appendicitis by means of a menstrual sign, 276
- , AND DI PALMA, SALVATORE, Analysis of 100 cases of ruptured ectopic gestation: technic and evaluation of autohemofusion, 857
- ROBLEE, MELVIN A., Treatment of cervicitis by cautery and electrocoagulation, 64
- ROSENFELD, SAMUEL S., Spontaneous rupture of the uterus following a wedge-shaped resection of the fundal portion, 436

S

- SCHIFFEY, LEWIS C., AND THUDIUM, WILLIAM J., End-results in the treatment of carcinoma of the cervix with radium, 247, 322
- SCHUCHET, SYDNEY S., AND LACKNER, JULIUS E., A review of the gynecologic literature of 1930, 326, 477. (Collective Review)

- SCHWARZ, OTTO H., AND DRABKIN, CHARLES, Basal metabolic rates in late pregnancy and the puerperium, 571
- SIEGEL, ISADORE A., An analysis of 115 cases of placenta previa, 110, 128
- SMITH, FRANK R., The significance of incomplete fusion of the Müllerian ducts in pregnancy and parturition, with a report of 35 cases, 714
- STEIN, IRVING F., AND COPE, ELIZABETH J., *Trichomonas vaginalis* (Donné). A preliminary study, 368, 445
- STEVENS, WILLIAM B., (WITH TITUS, R. S.), Normal pregnancy in a patient with preexisting complete heart-block, 773
- STANDER, H. J., In memoriam, John Whitridge Williams, 1866-1931, 661
- , Studies on avertin, 219
- , What are the functions of a University Woman's Clinic, 376
- , AND PECKHAM, C. H., Prognosis in nephritis complicating pregnancy, 626

T

- TAUSSIG, FRED J., Abortion in relation to fetal and maternal welfare, 729, 868
- , Breech presentation, 304
- , The abortion problem in Russia, 134 (Correspondence)
- THOMPSON, WILLIAM MCI., Report of a case of endometriosis of the umbilicus, 917, 949
- THOMS, HERBERT, John Stearns and pulvis parturiens, 418
- THUDIUM, WILLIAM J., (WITH SCHEFFEY, LEWIS C.), End-results in the treatment of carcinoma of the cervix with radium, 247, 322
- TIEMEYER, ARTHUR CHARLES, A case of placenta accreta, 106, 127
- TITUS, R. S., The detection of impending intrauterine death, 382, 451
- , AND STEVENS, WILLIAM B., Normal pregnancy in a patient with pre-existing complete heart-block, 773
- TOOMBS, PERCY W., The relationship between mother's gain during pregnancy and infant's birth weight, 851

V

- VAN ETEN, ROYAL C., Is salpingitis a factor in the incidence of tubal pregnancy, 645

W

- WARD, GEORGE GRAY, AND FARRAR, LILIAN K. P., Reradiations in the radium therapy of carcinoma of the cervix uteri, 543
- WATERS, EDWARD G., A report of three cases of placenta succenturiata, 921
- WILLIAMSON, HERVEY C., A simple technic for cesarean section under local infiltration anesthesia, 761
- WILLIAMS, J. WHITRIDGE, Regeneration of the uterine mucosa after delivery, with especial reference to the placental site, 664
- WILSON, KARL M., AND CORNER, GEORGE W., The results of the rabbit ovulation test in the diagnosis of pregnancy, 513

Z

- ZWEIBEL, LEONARD, (WITH POLAK, JOHN OSBORN, AND MAZZOLA, VINCENT P.), The value of hypertonic glucose therapy in pre- and post-operative conditions, 817

SUBJECT INDEX*

A

- Abdominal operations during pregnancy, (Hammond), 878
- Abdomino-pelvic diagnosis in women, (Valscheid), 475 (Book Review)
- Ablatio placentae, conservative treatment of, (Kornfeld), 101
- Abortion and premature labor, (Adair), 467
- cause and prevention of, (Taussig), 868
- criminal, (Taussig), 867
- frequency of, (Taussig), 731
- functional status of thyroid in pathogenesis of, (Abruzzese), 655 (Abst.)
- in Louisville City Hospital, two years' résumé of, (Johnson), 778
- in relation to fetal and maternal welfare, (Taussig), 729, 868
- legalized in Russia, (Taussig), 876
- literature of 1930 on, (Greenhill), 144; (Schochet and Lackner), 489
- maternal morbidity after, (Taussig), 876
- mortality of, (Taussig), 872
- problem in Russia, (Taussig), 134
- Russian experiment, (Taussig), 876
- spontaneous, (Adair), 868
- Abscess in abdominal wall simulating ruptured ectopic gestation, (Malan and Mackintosh), 232 (Abst.)
- of uterus, (Tommaselli), 280 (Abst.)
- Abstracts, endocrinology, 654
- miscellaneous. 45, 59, 96, 116, 224, 238, 254, 280, 296, 303, 318, 350, 359, 399, 415, 432, 443, 512, 542, 603, 625, 649, 735, 755, 825, 881, 923, 927
- sterility, 167
- Adenomyoma of uterus, (Holden), 799
- radiotherapy of, (Corscaden), 81
- Adnexa, diseases of, radiotherapy of, (Corscaden), 82
- Adrenals in eclampsia, (Acosta-Sison), 41
- Allonal, reaction to, (Maxwell), 583
- American Board of Obstetrics and Gynecology, 337, 600, 850 (Items)
- Gynecological Society, transactions of, 785, 928
- Amniotic liquid, action of, on formation of postoperative peritoneal adhesions, (Giordanengo), 923 (Abst.)
- Analgesia and anesthesia in obstetrics, literature for 1930 on, (Greenhill), 152
- pernocton in obstetrics and gynecology, (Brown, et al.), 225
- Anatomico-clinical diagnostics of Paul Lecenc, (Pavic and Moulounguet) 473 (Book Review)
- Anesthesia, avertin, studies on, (Stander), 219
- in gynecology, literature of 1930 on, (Schochet and Lackner), 329
- local infiltration, simple technic for cesarean section under, (Williamson), 761
- nupercaine subdurally in obstetrics, (Cosgrove), 763
- Antenatal care, (Haultain and Fahmy), 473 (Book Review)

- Anterior hypophyseal implants, effect of, upon scilicet ovaries of mice, (Hoffman), 231
- hypophysis and the ovaries, interrelationship of, (Fluhmann), 803
- lobe of fetal hypophysis, hormonal value of, in animal experiments, (Schultze-Rhonof and Niedenthal), 656 (Abst.)
- pituitary and placenta, (Philipp), 656 (Abst.)
- lutinizing substance, use of, in treatment of functional uterine bleeding, (Novak and Hurd), 501
- Appendicitis and acute initial salpingitis, differential diagnosis of, by means of a menstrual sign, (Rleci), 276
- Arrhenoblastoma of ovary, (Meyer), 706
- Arthropathia ovaripriva, prognosis and therapy of, (Lauber and Ramm), 660 (Abst.)
- Aschheim-Zondek reaction for pregnancy, (Dodds), 529
- Autohemofusion, technic and evaluation, (Ricci and Di Palma), 857
- Autotransplants of endometrium in peritoneum of rabbits, (Molinengo), 59 (Abst.)
- Avertin, studies on, (Stander), 219

B

- Bacterial content of uterine cavity in pregnant and nonpregnant women, (Gundel and Oettingen), 755 (Abst.)
- Baldwin modification of Jarcho pressometer for transuterine insufflation, pneumoperitoneum and uterosalpingostomy, (Baldwin), 783
- Baltimore Gynecological and Obstetrical Society, 125
- Barbituric acid hypnotics, clinical study of postoperative value of, (Maxwell), 579
- Basal metabolic rates in late pregnancy and puerperium, (Schwarz and Drabkin), 571
- Bathing during pregnancy, (Adair), 462
- Biologist, creed of, (Warthin), 472 (Book Review)
- Birth control, physicians' manual of, (Konikow), 471 (Book Review)
- weight, infant's, relationship between mother's gain during pregnancy and, (Toombs), 851
- Bladder, female urinary, aberrant endometrial growths of, (Ottow), 96 (Abst.)
- Blood, accumulation of, in peritoneum, (Candela), 45 (Abst.)
- and urine of newborn, female sex hormone in, (Bruchl), 658 (Abst.)
- menstrual, morphology of, and its diagnostic value, (Geist), 532
- sugar in eclampsia, (Laferty), 637
- transfusions, study of five hundred, (Burwell), 261
- Books received, 339
- reviewed, 140, 323, 470

*July, pp. 1-172; August, pp. 173-340; September, pp. 341-500; October, pp. 501-660; November, pp. 661-816; December, pp. 817-950.

- Bowels during pregnancy, (Adair), 463
 Brain in eclampsia, (Acosta-Sison), 40
 Breasts during pregnancy, (Adair), 464
 lesions of, (Moulouquet), 473 (Book Review)
 literature of 1930 on, (Schochet and Laekner), 331
 Breech presentations, (Taussig), 304
 relation of, to fetal mortality, (Grier), 896
 Brooklyn Gynecological Society, transactions of, 121, 454
 Burns, radium and x-ray, (Corseaden), 75

C

- Calcium-phosphorus ratio in serum of syphilitic pregnant women, (Klauder and Brown), 60
 Cancer, cervical, follow-up study of one hundred ninety-two, (Lyneh), 550
 therapy of operable and inoperable, in the light of a systemic conception of malignancy, (Meyer), 470 (Book Review)
 Carcinoma of cervix, treatment of, with radium, (Scheffey and Thudium), 247
 uteri, five-year cures in, study of, (Crossen), 559
 reradiations in, radium therapy of, (Ward and Farrar), 543
 of fallopian tube, primary, (Anspach and Hoffman), 424; (Holland), 45
 of uterus, radiotherapy of, (Corseaden), 80
 Cardiac disease and pregnancy, (Adair), 468
 Cauterization of cervix, vaginal speculum for, (Lifvendahl), 444
 Cautery and electrocoagulation, treatment of cervicitis by, (Roblee), 64
 Cervical cancer, follow-up study of, (Lyneh), 550
 dilator, (McCalla), 428
 Cervicitis, cautery and electrocoagulation, treatment of, with, (Roblee), 64
 Cervix, carcinoma of, treatment of, with radium, (Scheffey and Thudium), 247
 cauterization of, vaginal speculum for, (Lifvendahl), 444
 uteri, carcinoma of, five-year cures in, study of, (Crossen), 559
 reradiations in radium therapy of, (Ward and Farrar), 543
 cauterization and electrocoagulation of, contraindications for, (Roblee), 71
 Cesarean section and forceps, relation of, to maternal and infant morbidity and mortality, (Plass), 176
 incidence of, (Plass), 188
 indications for, in Essex County, N. J. hospitals for years 1927-1929, (H), 131
 infant mortality following, (Plass), 194
 maternal morbidity following, (Plass), 191
 mortality following, (Plass), 192
 relation of, to fetal mortality, (Grier), 897
 under local infiltration anesthesia, simple technic for, (Williamson), 761
 Chicago Gynecological Society, transactions of, 445, 946, 949
 Childbearing, functional study of, (De Garis), 473 (Book Review)
 mortality from, responsibility of medical profession in, (Kosmak), 748

- Chloride, determination of, in perspiration in connection with the total body saline content, (Tario and Olerskaja), 350 (Abst.)
 Chorionepithelioma, perforating, of the uterus with free intraperitoneal hemorrhage, (Anspach and Hoffman), 239
 Clinie, University Woman's, functions of, (Stander), 376
 Clinicopathologic study of eclampsia, (Acosta-Sison), 35
 Clothing during pregnancy, (Adair), 465
 Colitis, ulcerative, complicated by pregnancy, (Bauman), 944
 complicating pregnancy and the puerperium, (Barnes and Hayes), 907
 Collective review: A review of the gynecologic literature of 1930, (Schochet and Laekner), 326, 477
 The interrelationship of the anterior hypophysis and the ovaries, (Fluhmann), 803
 The obstetric literature of 1930, (Greenhill), 141
 Contracted pelvis, diagnosis of, by impression method, (Hillis), 449
 Contractions of monkey uterus at term, (Ivy, et al.), 388
 Corpus luteum, function of the, (Corner), 125
 physiology of, (Knaus), 658 (Abst.)
 rupture of a, with intraabdominal hemorrhage, (Greenhill), 902
 uteri, tuberculosis of, without involvement of endometrium, (Brown), 255
 Correspondence, (Andrews), 500
 The abortion problem in Russia (Taussig), 134
 Treatment of forceps marks in the newborn, (Day), 336
 Cramps during pregnancy, (Adair), 466
 Cystoscopy, eyepiece for teaching, (Kahn), 926
 Cysts, endometrial, spontaneous rupture of, (Novak), 826

D

- Delivery, breech presentations, relation of, to fetal mortality, (Grier), 896
 cesarean section, relation of, to fetal mortality, (Grier), 897
 fetal mortalities in relation to types of, (Grier), 894
 forceps, (Plass), 180
 regeneration of uterine mucosa after, (Williams), 664
 rigor mortis of fetus causing obstruction in, (Leff), 317
 type of, relation of maternal deaths to, (Plass), 178
 version, relation of, to fetal mortality, (Grier), 896
 Diathermy of thyroid on essential metrorrhagias, research studies and clinical results on, (Paroli), 655 (Abst.)
 pelvic, (Gellhorn), 297
 Diet in pregnancy, (Adair), 460
 Disgerminoma ovarii, so-called seminoma, (Meyer), 697
 Dyes, elimination of, by the uterine mucosa, (Meyer), 825 (Abst.)

E

- Eclampsia, blood sugar in, (Laferty), 637
 clinicopathologic study of, (Acosta-Sison), 35
 gum aacia in treatment of, (Dieckmann), 351
 surgical indication in, (Gordon), 97

Eclampsia, Cont'd

- urinary protein in, nature of, (Eastman), 756
- Ectopic gestation, ruptured, (Ricci and Di Palma), 857
 - abscess in abdominal wall simulating, (Malan and Mackintosh), 432 (Abst.)
 - unusual case of, (Smylie), 924
- Editorial comment, pediatric education, 650
- Electrocoagulation, treatment of cervicitis by cautery and, (Roblee), 64
- Elliott treatment, new method of applying vaginal heat, (Holden and Gurnee), 87
- Endocervical secretions, hydrogen-ion concentration of the, (Meaker and Glaser), 167 (Abst.)
- Endocrinology, 654 (Absts.)
- Endometrial cysts, spontaneous rupture of, (Novak), 826
 - growths of female urinary bladder, aberrant, (Ottow), 96 (Abst.)
- Endometrioma, etiology of, (Candela), 45 (Abst.)
- Endometriosis, literature of 1930 on, (Schochet and Lackner), 489
 - of the umbilicus, (Thompson), 917
 - pelvic, (Novak), 826
 - tubal origin of, (Everett), 1
- Endometrium, autotransplants of, in peritoneum of rabbits, (Molinengo), 59 (Abst.)
 - tuberculosis of corpus uteri without involvement of, (Brown), 255
- Epithelioma of vagina, (Moench), 837
- Epithelium stratified, formation of, in castrated white mice after injection with sea water, (Knoche), 738 (Abst.)
- Ergot, John Stearns and, (Thoms), 418
- Essex County, N. J. hospitals, analysis of obstetric work done in, for years 1927-1929, (Ill), 129
- Estrin or thelin, (Dodds), 520
- Estrus-producing hormone, (Dodds), 520
- Exercise during pregnancy, (Adair), 462
 - influence of, on female constitution, labor and menstruation, (Düntzer and Hellendall), 927 (Abst.)
- Extrauterine pregnancy, literature of 1930 on, (Schochet and Lackner), 490

F

- Fainting during pregnancy, (Adair), 466
- Fallopian tubes, carcinoma of, (Holland), 45 (Abst.)
 - primary, (Anspach and Hoffman), 424
 - transplantation of, from one woman to another, (Kakuschkin), 171 (Abst.)
- Fecundation, artificial, (Vignes), 171 (Abst.)
- Fertility, sperm morphology in relation to, (Moench and Holt), 199
 - vitamin E of, (Rio), 167 (Abst.)
- Fetal monstrosities, iniencephalus, with report of a case, (Bear), 429
 - meningo encephalocele with microcrania, (Reycraft), 433
 - morbidity and mortality after forceps delivery, (Plass), 186
 - mortality, (Grier), 890
 - welfarc, abortion in relation to, (Tausig), 729
- Fetus, death of, hemorrhage from a ruptured varicosity in placenta causing, (Leff), 117
 - intrauterine death, impending, the detection of, (Titus), 382
 - retroflexus, report of a case, (Bear), 429

Fetus, Cont'd

- rigor mortis of, causing obstruction in delivery, (Leff), 317
- Fibroma of uterus and hypophysis, (Scaglione), 656 (Abst.)
 - pedunculated, of the labium majus developed from the extrainguinal portion of the round ligament, (Barbanti-Silva), 318 (Abst.)
- Fibromyoma, pedunculated cystic, arising from the fundus uteri removed postpartum, (Harriman), 119
- Folliculine and thyroid, (Gilardino), 654 (Abst.)
- Follow-up study of cervical cancers, (Lynch), 550
- Forceps and cesarean section, relation of, to maternal and infant morbidity and mortality, (Plass), 176
 - delivery, relation of, to fetal mortality, (Grier), 895
 - marks in the newborn, treatment of, (Day), 336
 - with a traction curve, a new, (Dennen), 258

G

- Genitalia, external, literature of 1930 on, (Schochet and Lackner), 333
 - internal, effects of sympathectomy of hypogastric artery on, (Chianello), 881 (Abst.)
 - influence of absence of vitamin E on, (Rio), 167 (Abst.)
- Genitourinary system, literature of 1930 on, (Schochet and Lackner), 331
- Gestation, (See Pregnancy)
- Glasgow Royal Maternity and Women's Hospital, report of, (Cruickshank), 473 (Book Review)
- Glucose therapy, hypertonic, value of, in pre- and postoperative conditions, (Polak, et al.), 817
- Gonorrhea, Elliott treatment of, (Holden and Gurnee), 91
- Granulosa cell tumors, (Meyer), 700
- Gum acacia in the treatment of eclampsia, (Dieckmann), 351
- Gynecology, abdomino-pelvic diagnosis in women, (Valscheid), 475 (Book Review)
 - aberrant endometrial growths of female urinary bladder, (Ottow), 96 (Abst.)
 - abscess of uterus, (Tommaselli), 280 (Abst.)
 - adenomyoma of uterus, (Holden), 799
 - anesthesia in, literature of 1930 on, (Schochet and Lackner), 329
 - anterior hypophysis and the ovaries, interrelationship of, (Fluhmann), 803
 - appendicitis and acute initial salpingitis, differential diagnosis of, by means of a menstrual sign, (Ricci), 276
 - arrhenoblastoma of ovary, (Meyer), 706
 - barbituric acid hypnotics, clinical study of postoperative value of, (Maxwell), 579
 - benign uterine conditions, radiotherapeutic treatment of, anatomic changes subsequent to, (Corscaden), 74
 - blood, accumulation of, in peritoneum, (Candela), 45 (Abst.)
 - transfusions, study of five hundred, (Burwell), 261
 - breasts, literature of 1930 on, (Schochet and Lackner), 331
 - cancer, cervical, follow-up study of, (Lynch), 550
 - carcinoma of cervix, treatment of, with radium, (Scheffey and Thudium), 247

Gynecology, Carcinoma of Cervix, Cont'd
 uteri, five-year cures in, study of, (Crossen), 559
 reradiations in radium therapy of, (Ward and Farrar), 543
 of fallopian tube, primary, (Anspach and Hoffman), 424; Holland), 45
 cauterization of cervix, vaginal speculum for, (Lifvendahl), 444
 cervical cancer, follow-up study of, (Lynch), 550
 dilator, (McCalla), 428
 cervicitis, treatment of, by cautery and electrocoagulation, (Roblee), 64
 chorionepithelioma, perforating, of uterus, with free intraperitoneal hemorrhage, (Anspach and Hoffman), 239
 corpus luteum, function of, (Corner), 125
 cystoscopy, eyepiece for teaching, (Kahn), 926
 cysts, endometrial, spontaneous rupture of, (Novak), 826
 diathermy, pelvic, (Gellhorn), 296
 dysgerminoma ovarii, so-called seminoma, (Meyer), 697
 Elliott treatment, (Holden and Gurnee), 87
 endocervical secretions, hydrogen-ion concentration of, (Meaker and Glaser), 167 (Abst.)
 endometrial cysts, spontaneous rupture of, (Novak), 826
 endometrioma, etiology of, (Candela), 45 (Abst.)
 endometriosis of tubal origin, (Everett), 1
 of umbilicus, (Thompson), 917
 pelvic, (Novak), 826
 epithelioma of the vagina, primary, (Moench), 837
 fallopian tubes, transplantation of, from one woman to another, (Kakusehkin), 171 (Abst.)
 fecundation, artificial, (Vignes), 171 (Abst.)
 fibroma of the labium majus, pedunculated, developed from the extralingual portion of the round ligament, (Barbanti-Silva), 318 (Abst.)
 fibromyoma, pediculated cystic, arising from the fundus uteri removed postpartum, (Harriman), 119
 general problems, literature of 1930 on, (Schochet and Laekner), 327
 genitourinary system, literature of 1930 on, (Schochet and Laekner), 331
 gonorrhea, Elliott treatment of, (Holden and Gurnee), 91
 granulosa cell tumors, (Meyer), 700
 handbook of, 140 (Book Review)
 headache at menopause, thyroid and, (Stevens), 655 (Abst.)
 hematocele from nonpregnant ovarian hemorrhage, (Volpe), 254 (Abst.)
 hernia in low median-line incisions, prevention and repair of, (Mason), 596
 hormones, nasal spray method of administering, (Pratt and Smeltzer), 542 (Abst.)
 hydrogen-ion concentration of endocervical secretions, (Meaker and Glaser), 167 (Abst.)
 hypertonic glucose therapy, value of, in pre- and postoperative conditions, (Polak, et al.), 817
 hysteroscope, a new, and its practical application in, (Mikulicz-Radceki and Freund), 303 (Abst.)
 infantilism and sterility, (Katz), 168 (Abst.)

Gynecology, Cont'd
 intrauterine pessaries, severe infection due to, (Tietze), 303 (Abst.)
 introduction to, (Miller), 324 (Book Review)
 Krukenberg tumor, (Greenhill), 445
 leiomyosarcoma of uterus, (Meaker), 400
 leucemia, acute lymphatic, complicating pregnancy, (Mann), 416
 leucorrhea and hemorrhage, (Runge and Schröder), 473 (Book Review)
 literature of 1930 on, a review of, (Schochet and Laekner), 326, 477
 menstrual disorders, literature of 1930 on, (Schochet and Laekner), 477
 nasal spray method of administering hormones, (Pratt and Smeltzer), 542 (Abst.)
 organotherapy, scientific basis of, (Hogben), 625 (Abst.)
 ovarian tumors, pathology of some special, and their relation to sex characteristics, (Meyer), 697
 parametrial infection, extension of, through the obturator foramen, phlegmon of the thigh following, (Ottow), 116 (Abst.)
 pelvic diathermy, (Gellhorn), 297
 endometriosis, (Novak), 826
 pernocton as an analgesic in, (Brown, et al.), 225
 pneumoperitoneum, Baldwin modification of Jareho pressometer for, (Baldwin), 783
 prolapse of uterus, complete, fatal uremia due to, (Frank), 270
 radiotherapy of benign uterine conditions, (Corseaden), 74
 reconstruction of urethra and vesical sphincter by employing levator ani muscles, (Douglass), 739
 reradiations in radium therapy of carcinoma of cervix uteri, (Ward and Farrar), 543
 rupture of a corpus luteum with intra-abdominal hemorrhage, (Greenhill), 902
 salpingo-oophoritis, frequency of pregnancy in women who have had, (Holtz), 167 (Abst.)
 sarcoma of uterus, (Kasman), 767
 sex hormones, clinical importance of, (Dodds), 520
 life of twenty-two hundred women, factors in, (Davis), 325 (Book Review)
 sterility, 167 (Absts.)
 and infantilism, (Katz), 168 (Abst.)
 diagnosis and treatment of, (Graff), 169 (Abst.); (Giles), 169 (Abst.)
 functional, (Mazer and Andrusier), 46
 relative fundamental nature of, (Meaker), 167 (Abst.)
 sterilization, problem in Scandinavia, (Forssner), 171 (Abst.)
 teratoma of ovary, large, first noted eight years after menopause, (Meagher), 454
 textbook of, (Curtis), 323 (Book Review)
 thyrotoxicosis complicated by pregnancy, (Fleischer), 273
 transplantation of fallopian tubes from one woman to another, (Kakusehkin), 171 (Abst.)
 of ureter into sigmoid in patient whose other kidney was functionless, (Pierce), 438
 transuterine insufflation, Baldwin modification of Jareho pressometer for, (Baldwin), 783

Gynecology, Cont'd

- trichomonas vaginalis, culture, incidence and treatment of, (Cornell, et al.), 360
- preliminary study of, (Stein and Cope), 368
- tubal insufflation in sterility, (Mayer), 170, (Willbrand), 170 (Abst.)
- sterilization through the uterine cavity, (Nishizaki), 171 (Abst.)
- tuberculosis of corpus uteri without involvement of endometrium, (Brown), 255
- tumors, granulosa cell, (Meyer), 700
- Krukenberg, (Greenhill), 445
- of the tube, (Conill), 296 (Abst.)
- uterine bleeding, functional, use of anterior pituitary luteinizing substance in treatment of, (Novak and Hurd), 501
- uterosalpingostomy, Baldwin modification of Jarcho pressometer for, (Baldwin), 783
- uterus, position of, based on a study of spinal pelvic relationship, (Magid), 281
- vaginal discharge, treatment of, (Adler), 238 (Abst.)
- heat, of applying, (Holden and Gurnee), 87
- hernia, posterior, treatment of, (Crousse), 224 (Abst.)
- vitamin E of fertility, (Rio), 167 (Abst.)

H

- Handbook of gynecology, (Stoeckel), 140 (Book Review)
- Headache at menopause, thyroid and, (Stevens), 655 (Abst.)
- Heart in eclampsia, (Acosta-Sison), 39
- rudimentary congenital, in newborn, (Kushner), 647
- Heart-block, complete, normal pregnancy in patient with preexisting, (Titus and Stevens), 773
- Heartburn during pregnancy, (Adair), 466
- Heat, vaginal, new method of applying (the Elliott treatment), (Holden and Gurnee), 87
- Hematocele from nongravid ovarian hemorrhage, (Volpe), 254 (Abst.)
- Hemoglobin, resistance of, in the gynecological field, (Davanzo), 443 (Abst.)
- Hemorrhage and leucorrhea, (Runge and Schröder), 473 (Book Review)
- intraabdominal, rupture of a corpus luteum with, (Greenhill), 902
- Hemorrhoids during pregnancy, (Adair), 467
- Hernia in low median-line incisions, prevention and repair of, (Masson), 596
- of umbilical cord, congenital, with eversion and absence of a vaginal, posterior, treatment of, (Crousse), 224 (Abst.)
- Hormonal sterilization of female organism, (Haberlandt), 512 (Abst.)
- temporary, of female animals by feeding insulin, (Vogt), 649 (Abst.)
- value of anterior lobe of fetal hypophysis in animal experiments, (Schultze-Rhonof and Niedenthal), 656 (Abst.)
- Hormone, estrus-producing, (Dodds), 520
- female sex, occurrence of, in blood and urine of newborn, (Bruchl), 658 (Abst.)
- male sex, influence of, on female sex glands and pregnancy, (Reiprich), 603 (Abst.)

- Hormones of ovary and pituitary gland, nasal spray method of administering, (Pratt and Meltzer), 542 (Abst.)
- sex, clinical importance of, (Dodds), 520
- Hydrogen-ion concentration of endocervical secretions, (Meaker and Glaser), 167 (Abst.)
- Hyperemesis gravidarum, use of Lugol's solution in, (Falls), 882
- Hyperhormonization with follicular liquids, effects of, on hypophysis, thyroid and suprarenals, (Bisceglie), 657 (Abst.)
- Hyperthyroidism, experimental, research on uteroovarian modification in, (Scibelli), 654 (Abst.)
- pregnancy complicating, and following thyroidectomy, (Fahrni), 655 (Abst.)
- Hypertonic glucose therapy, value of, in pre- and postoperative conditions, (Polak, et al.), 817
- Hysteroscope, a new, and its practical application in gynecology, (Mikulicz-Radecki and Freund), 303 (Abst.)

I

- Icterus neonatorum, clinical observations on the etiology of, (Franklin), 913
- In memoriam—Polak, John Osborn, 173
- Williams, John Whitridge, 661
- Incretotherapy, follicular, luteinic and mammarian, and its influence on genital tract and on endocrine system, (Candela), 657 (Abst.)
- Infantilism and sterility, (Katz), 168 (Abst.)
- Inflammations following radium insertion, (Corscaden), 75
- Intelligence, with report of a case, (Bear), 429
- Insulin, temporary hormonal sterilization of female animals by feeding, (Vogt), 649 (Abst.)
- Intercourse during pregnancy, (Adair), 464
- Intestinal obstruction in newborn due to mucous plug, (Falls and Jaffe), 409
- Intrauterine death, impending, the detection of, (Titus), 382
- pessaries, severe infection due to, (Tietze), 303 (Abst.)
- Inversion of uterus, acute puerperal, treated by abdominal replacement, (Irving and Kellogg), 440
- Iodine, effect of, on ovary, (Brande and Schwarzmann), 658 (Abst.)
- Item, American Board of Obstetrics and Gynecology, 337, 660, 815

J

- Jarcho pressometer, Baldwin modification of, for transuterine insufflation, pneumoperitoneum and uterosalpingostomy, (Baldwin), 783

K

- Kidneys during pregnancy (Adair), 463
- in eclampsia, (Acosta-Sison), 39
- Krukenberg tumor, (Greenhill), 445

L

- Labium majus, pedunculated fibroma of the, developed from the extralingual portion of the round ligament, (Barbanti-Silva), 318 (Abst.)

Labor, influence of exercise on, (Düntzer and Hellendall), 927 (Abst.)
length of, (Calkins, et al.), 604
literature of 1930 on, (Greenhill), 130
onset of, relation of, to fetal mortality, (Grier), 891
premature, (Adair), 467
relation of, to fetal mortality, (Grier), 891
Lactation, parotid swelling associated with, (Phillips), 434
Leiomyosarcoma of the uterus, (Meaker), 400
Leucemia, acute lymphatic, complicating pregnancy, (Mann), 416
Leucorrhoea and hemorrhage, (Runge and Schröder), 473 (Book Review)
during pregnancy, (Adair), 467
Levator ani muscles, reconstruction of urethra and vesical sphincter by employing, (Douglass), 739
Life, control of, unification of science and its relation to, (Graves), 341
Literature, obstetric, of 1930, (Greenhill), 141
Liver in eclampsia, (Acosta-Sison), 38
Lugol's solution, use of, in hyperemesis gravidarum, (Falls), 882
Lungs in eclampsia, (Acosta-Sison), 40

M

Malignancy, literature of 1930 on, (Schochet and Lackner), 484
Malpositions, literature of 1930 on, (Schochet and Lackner), 483
Marriage, ideal, (Van de Velde), 473 (Book Review)
Maternal deaths, causes of, at Essex County, N. J. hospitals for years 1927-1929, (Ill), 132
impressions during pregnancy, (Adair), 464
morbidity after abortion, (Taussig), 876
mortality of abortion, (Taussig), 872
pathology, relation of, to fetal mortality, (Grier), 892
welfare, abortion in relation to, (Taussig), 728
Meningoencephalocele with microcrania, (Reycraft), 433
Menopause, headache at, thyroid and, (Stevens), 655 (Abst.)
Menstrual blood, morphology of, and its diagnostic value, (Geist), 532
disorders as causes of disease, (Aschner), 659 (Abst.)
literature of 1930 on, (Schochet and Lackner), 477
sign, differential diagnosis of acute initial salpingitis and appendicitis by means of, (Reel), 276
Menstruation, influence of exercise on, (Düntzer and Hellendall), 927 (Abst.)
too infrequent, or scanty, joint diseases resulting from, (Aschner), 659 (Abst.)
types of, in sterile women, (Mazer and Andrusier), 51
Metrorrhagias, diathermy of thyroid on the essential, research studies and clinical results, (Paroli), 655 (Abst.)
thyroid function in so-called essential, (Abruzzese), 651 (Abst.)
Monkey uterus at term, contractions of, (Ivy, et al.), 388
Monstrosities, fetal, microcephalus with report of case, (Bear), 429
meningo-encephalocele with microcrania, (Reycraft), 433
Mortality from childbearing, responsibility of medical profession in, (Kosmak), 748
Mother's age, relation of, to fetal mortality, (Grier), 891

Müllerian ducts, incomplete fusion of, in pregnancy and parturition, significance of, (Smith), 714

N

Nasal spray method of administering hormones, (Pratt and Smeltzer), 542 (Abst.)
Nausea and vomiting of pregnancy, (Adair), 467
Nephritis complicating pregnancy, prognosis in, (Stander and Peckham), 626
New York Obstetrical Society, transactions of, 319, 799
Newborn, blood and urine of, female sex hormone in, (Bruehl), 658 (Abst.)
Chinese, weights and measurements of, (Lee), 415 (Abst.)
forceps marks in, treatment of, (Day), 336
icterus neonatorum, clinical observations on etiology of, (Franklin), 913
infant, behavior of, (Pratt, et al.), 325 (Book Review)
intestinal obstruction in, due to mucous plug, (Falls and Jaffe), 409
literature of 1930 on, (Greenhill), 159
rudimentary congenital heart in, (Kushner), 647
weights and measurements of the Chinese, (Lee), 415 (Abst.)
Nupercaine subdurally in obstetrics, (Coscgrove), 763

O

Obituary, Polak, John Osborn, 173
Williams, John Whitridge, 661
Obstetric literature of 1930, (Greenhill), 141
work done in Essex County, N. J. hospitals, analysis of, for years 1927-1929, (Ill), 129
Obstetrical Society of Boston, transactions of, 451
of Philadelphia, transactions of, 320
Obstetrics, abdominal operations during pregnancy, (Hammond), 878
ablation placenta, conservative treatment of, (Kornfeld), 101
abortion, (Adair), 467
In Louisville City Hospital, two years' résumé of, (Johnson), 778
in relation to fetal and maternal welfare, (Taussig), 729, 863
problem in Russia, (Taussig), 134
acute lymphatic leucemia complicating pregnancy, (Mann), 416
and gynecology for the general practitioner, (Abel), 472 (Book Review)
antenatal care, (Haultain and Fahmy), 473 (Book Review)
basal metabolic rates in late pregnancy and puerperium, (Schwarz and Drabkin), 571
bathing during pregnancy, (Adair), 462
blood sugar in eclampsia, (Laferty), 637
bowels during pregnancy, (Adair), 463
breasts during pregnancy, (Adair), 464
breech presentation, (Taussig), 304
relation of, to fetal mortality, (Grier), 896
cardiac disease and pregnancy, (Adair), 463
cesarean section, relation of, to fetal mortality, (Grier), 897
under local infiltration anesthesia, simple technique for, (Williamson), 761
clothing during pregnancy, (Adair), 465

Obstetrics, Cont'd

- contracted pelvis, diagnosis of, by impression method, (Hillis), 449
- contractions of monkey uterus at term, (Ivy, et al.), 388
- cramps during pregnancy, (Adair), 466
- delivery, rigor mortis of fetus causing obstruction in, (Leff), 317
 - type of, relation of maternal deaths to, (Plass), 178
- diet in pregnancy, (Adair), 460
- eclampsia, blood sugar in, (Laferty), 637
 - clinico-pathologic study of, (Acosta-Sison), 35
 - gum acacia in treatment of, (Dieckmann), 351
 - surgical indications in, (Gordon), 97
 - urinary protein in, nature of, (Eastman), 756
- ectopic pregnancy, ruptured, (Rice and Di Palma), 857
 - unusual case of, (Smylie), 924
- exercise during pregnancy, (Adair), 462
- fainting during pregnancy, (Adair), 466
- fetal morbidity and mortality after forceps delivery, (Plass), 186
 - mortality, (Grier), 890
- fetus, death of, hemorrhage from a ruptured varicosity in placenta, causing, (Leff), 117
 - retroflexus, (Bear), 429
 - rigor mortis of, causing obstruction in delivery, (Leff), 317
- forceps and cesarean section, relation of, to maternal and infant morbidity and mortality, (Plass), 176
 - delivery, relation of, to fetal mortality, (Grier), 895
 - marks, in the newborn, treatment of, (Day), 336
 - with a traction curve, a new, (Dennen), 258
- gum acacia in treatment of eclampsia, (Dieckmann), 351
- heart-block complete, normal pregnancy in patient with preexisting, (Titus and Stevens), 773
- heartburn during pregnancy, (Adair), 466
- hemorrhage from a ruptured varicosity in the placenta, causing death of the fetus (Leff), 117
- hemorrhoids during pregnancy, (Adair), 467
- hernia of umbilical cord; congenital, with eventration and absence of a sac, (Krumm), 442
- hyperemesis gravidarum, use of Lugol's solution in, (Falls), 882
- icterus neonatorum, clinical observations on etiology of, (Franklin), 913
- incomplete fusion of müllerian ducts in pregnancy and parturition, significance of, (Smith), 714
- iniencephalus, with report of a case, (Bear), 429
- intereourse during pregnancy, (Adair), 464
- intrauterine death, impending, the detection of, (Titus), 382
- inversion of uterus, acute puerperal, treated by abdominal replacement, (Irving and Kellogg), 440
- kidneys during pregnancy, (Adair), 463
- labor, length of, (Calkins, et al.), 604
- premature, (Adair), 467
- lactation, parotid swelling associated with, (Phillips), 434
- leucorrhea during pregnancy, (Adair), 467
- literature of 1930 on, (Greenhill), 141

Obstetrics, Cont'd

- maternal and infant morbidity and mortality, relation of forceps and cesarean section to, (Plass), 176
 - impressions during pregnancy, (Adair), 464
- mortality of abortion, (Taussig), 872
- meningo encephalocele with microcrania, (Reycraft), 433
- mortality from childbearing, responsibility of medical profession in, (Kosmak), 748
- nausea and vomiting of pregnancy, (Adair), 467
- nephritis complicating pregnancy, prognosis in, (Stander and Peckham), 626
- newborn, behavior of, (Pratt, et al.), 325 (Book Review)
 - Chinese, weights and measurements of, (Lee), 415 (Abst.)
 - forceps marks in, treatment of, (Day), 336
 - intestinal obstruction in, due to mucous plug, (Falls and Jaffe), 409
 - weights and measurements of the Chinese, (Lee), 415 (Abst.)
- nupercalne subdurally in, (Cosgrove), 763
- operative, literature for 1930 on, (Greenhill), 143
 - on the manikin, (Reed), 471 (Book Review)
- pelvic measurements, maternal, among the Chinese, (Lee), 359 (Abst.)
- pernocton as an analgesic in, (Brown, et al.), 225
- placenta accreta, (Feiner), 312
 - case of, (Tiemeyer), 106
 - hemorrhage from a ruptured varicosity in, causing death of the fetus, (Leff), 117
 - previa, analysis of 115 cases of, (Siegel), 110
 - succenturiata, three cases of, (Waters), 921
- urea content of, (Wehefritz and Gierhake), 399 (Abst.)
- pregnancy, (See Pregnancy)
- prenatal care, standards of, (Adair), 458
- presentation, abnormal, (Adair), 469
- preservation of the figure during pregnancy, (Adair), 464
- rabbit ovulation test in diagnosis of pregnancy, (Wilson and Corner), 513
- rest during pregnancy, (Adair), 462
- rigor mortis of fetus causing obstruction in delivery, (Leff), 317
- rupture of uterus, spontaneous, following a wedge-shaped resection of the fundal portion, (Rosenfeld), 436
- syphilis and pregnancy, (Adair), 468
- syphilitic pregnant women, calcium-phosphorus ratio in serum of, (Klauder and Brown), 60
- teeth during pregnancy, (Adair), 463
- tetanoloid syndrome in pregnancy, (Hartley), 655 (Abst.)
- theory of, (De Garis), 473 (Book Review)
- toxemia of pregnancy, (Adair), 468
- tubal pregnancy, incidence of salpingitis in, (Van Etten), 645
- ulcerative colitis complicating pregnancy and the puerperium, (Barnes and Hayes), 907
- urinary protein in eclampsia, nature of, (Eastman), 756
 - traet infections during pregnancy, (Morris and Langlois), 211

Obstetrics, Cont'd

- uterine mucosa, regeneration of, after delivery, with especial reference to placental site, (Williams), 664
 - varicose veins during pregnancy, (Adair), 466
 - version, relation of, to fetal mortality, (Grier), 896
 - vertex occipito-posterior position, treatment of, (Bill), 615
 - weight during pregnancy, (Adair), 462
 - Organotherapy in treatment of functional sterility, (Mazer and Andrussier), 56
 - scientific basis of, (Hogben), 625 (Abst.)
 - Ovarian dysfunction, roentgen rays in treatment of, (Ford), 542 (Abst.)
 - hypofunction, primary, (Mazer and Andrussier), 50
 - transplantation, after loss of both ovaries, results of, (Siebert), 659 (Abst.)
 - tumors, pathology of some special, and their relation to sex characteristics, (Meyer), 697
 - Ovaries, senile, of mice, effect of anterior hypophyseal implants upon, (Hoffman), 231
 - Ovary, anterior hypophysis and interrelationship of, (Fluhmann), 803
 - arrhenoblastoma of the, (Meyer), 706
 - effect of iodine on, (Brandt and Schwarzmunn), 658 (Abst.)
 - function of, dependence of uterine musculature upon, (Siegmund), 657 (Abst.)
 - hormones, nasal spray method of administering, (Pratt and Smeltzer), 542 (Abst.)
 - literature of 1930 on, (Schochet and Lackner), 495
 - teratoma of, large, first noted eight years after menopause, (Meagher), 454
- P
- Pancreas in eclampsia, (Acosta-Sison), 41
 - Parametrial infection, extension of, through the obturator foramen, deep phlegmon of the thigh following, (Ottow), 116 (Abst.)
 - Parotid swelling associated with lactation, (Phillips), 434
 - Parturition, incomplete fusion of the müllerian ducts in, significance of, (Smith), 714
 - maternal, relation of, to fetal mortality, (Grier), 892
 - or ovarian tumors, some special, and their relation to sex characteristics, (Meyer), 697
 - placental, relation of, to fetal mortality, (Grier), 893
 - Pediatric education, (Adair), 650
 - Pelvic diathermy, (Gellhorn), 297
 - endometriosis, (Novak), 826
 - measurements, maternal, among the Chinese, (Lee), 359
 - Pelvis, contracted, diagnosis of, by impression method, (Hillis), 449
 - Peritoneum, accumulation of blood in, (Candela), 45 (Abst.)
 - Peritoneum, autotransplants of, endometrium in, in rabbits, (Mollinengo), 59 (Abst.)
 - Pernoxon as an analgesic in obstetrics and gynecology, (Brown, et al.), 225
 - Pessaries, intrauterine, infection due to, seven cases of severe, (Tietze), 303 (Abst.)
 - Philadelphia Obstetrical Society, transactions of, 119, 944
 - Phlegmon of the thigh, deep, following extension of a parametrial infection through the obturator foramen, (Ottow), 116 (Abst.)
 - Physicians and surgeons, American, (Fifield), 325 (Book Review)
 - Physiology of pregnancy, literature of 1930 on, (Greenhill), 141
 - Pituitary, anterior, luteinizing substance, use of, in treatment of functional uterine bleeding, (Novak and Hurd), 501
 - gland, hormones of, nasal spray method of administering, (Pratt and Smeltzer), 542 (Abst.)
 - malfunction, primary, (Mazer and Andrussier), 51
 - Placenta accreta, case of, (Tiemeier), 106
 - clinical consideration of, (Feiner), 312
 - management of, (Feiner), 312
 - pathology of, (Feiner), 312
 - anterior pituitary and, (Philipp), 656 (Abst.)
 - hemorrhage from a ruptured varicosity in, causing the death of the fetus, (Leff), 117
 - literature of 1930 on, (Greenhill), 162
 - previa, analysis of 115 cases of, (Siegel), 110
 - succenturiata, three cases of, (Waters), 921
 - urea content of, (Wehefritz and Gierhake), 399 (Abst.)
 - Placental pathology, relation of, to fetal mortality, (Grier), 893
 - site, regeneration of uterine mucosa after delivery, with especial reference to, (Williams), 664
 - Pneumoperitoneum, Baldwin modification of Jarcho pressometer for, (Baldwin), 783
 - Practitioner, general, obstetrics and gynecology for, (Abel), 472 (Book Review)
 - Pregnancy, abdominal operations during, (Hammond), 878
 - acute lymphatic leucemia complicating, (Mann), 416
 - and-syphilis, (Adair), 468
 - Aschheim-Zondek reaction for, (Dodds), 529
 - basal metabolic rates in late, (Schwarz and Drabkin), 571
 - bathing during, (Adair), 462
 - bowels during, (Adair), 463
 - breasts during, (Adair), 464
 - cardiac disease and, (Adair), 468
 - clothing during, (Adair), 465
 - complicating hyperthyroidism and following thyroidectomy, (Fahrni), 655 (Abst.)
 - complications of, literature of 1930 on, (Greenhill), 144
 - cramps during, (Adair), 466
 - diet in, (Adair), 460
 - regulation of, (Toombs), 853
 - ectopic, ruptured, (Ricci and Di Palma), 857
 - unusual case of, (Smylie), 924
 - exercise during, (Adair), 462; (Toombs), 854
 - extrauterine, literature of 1930 on, (Schochet and Lackner), 490
 - fainting during, (Adair), 466
 - family history in, (Adair), 458
 - frequency of, in women who have had salpingo-oophoritis, (Holtz), 167 (Abst.)
 - heartburn during, (Adair), 466
 - hemorrhoids during, (Adair), 467
 - incomplete fusion of müllerian ducts in, significance of, (Smith), 714
 - influence of male sex hormone on, (Reiprich), 603 (Abst.)

Pregnancy, Cont'd

- intercourse during, (Adair), 464
 - kidneys during, (Adair), 463
 - leucorrhea during, (Adair), 467
 - literature of 1930 on, (Greenhill), 141
 - maternal impressions during, (Adair), 464
 - minor discomforts of, (Adair), 466
 - mother's gain during, and infant's birth weight, relationship between, (Toombs), 551
 - nausea and vomiting of, (Adair), 467
 - nephritis complicating, prognosis in, (Stander and Peckham), 626
 - normal, in patient with preexisting complete heart-block, (Titus and Stevens), 773
 - physical examination in, (Adair), 459
 - physiology, literature of 1930 on, (Greenhill), 141
 - preservation of the figure during, (Adair), 464
 - rabbit ovulation test in diagnosis of, (Wilson and Corner), 513
 - rest during, (Adair), 462
 - rupture of the uterus, spontaneous, following a wedge-shaped resection of the fundal portion, (Rosenfeld), 436
 - teeth during, (Adair), 463
 - tetanoid syndrome in, (Hartley), 655 (Abst.)
 - thyrotoxicosis complicated by, (Fleischer), 273
 - toxemia of, (Adair), 468
 - literature of 1930 on, (Greenhill), 147
 - relation of, to fetal mortality, (Grier), 892
 - tubal, incidence of salpingitis in, (Van Etten), 645
 - ulcerative colitis complicated by, (Bauman), 944
 - complicating, (Barnes and Hayes), 907
 - urinary tract infections during, (Morris and Langlois), 211
 - varicose veins during, (Adair), 466
 - weight during, (Adair), 462
 - Prenatal care, standards of, (Adair), 458
 - Presentation, abnormal, (Adair), 469
 - Prolapse of uterus, complete, fatal uremia due to, (Frank), 270
 - Pseudomenstruation in human, occurrence of, (Mazer and Andrusier), 52
 - in the monkey, occurrence of, (Mazer and Andrusier), 49
 - Puerperium, basal metabolic rates in, (Schwarz and Drabkin), 571
 - literature of 1930 on, (Greenhill), 156
 - ulcerative colitis complicating pregnancy and, (Barnes and Hayes), 907
- R
- Rabbit ovulation test in diagnosis of pregnancy, (Wilson and Corner), 513
 - Radiotherapeutic treatment of benign uterine conditions, anatomic changes subsequent to, (Corscaden), 74
 - Radium, introduction of, into uterus, death following, (Corscaden), 75
 - therapy of carcinoma of cervix uteri, reradiations in, (Ward and Farrar), 543
 - treatment of carcinoma of cervix with, (Scheffey and Thudlum), 247
 - Reproductive organs, tumors of, (Corscaden), 84
 - Reradiations in radium therapy of carcinoma of cervix uteri, (Ward and Farrar), 543
 - Rest during pregnancy, (Adair), 462

- Rigor mortis of fetus causing obstruction in delivery, (Leff), 317
- Roentgen rays in treatment of ovarian dysfunction, (Ford), 542 (Abst.)
- Rudimentary congenital heart in newborn, (Kushner), 647
- Rupture of corpus luteum with intra-addominal hemorrhage, (Greenhill), 902
 - of endometrial cysts, spontaneous, (Novak), 826
 - of uterus, spontaneous, following a wedge-shaped resection of the fundal portion, (Rosenfeld), 436
- Ruptured ectopic gestation, (Ricci and Di Palma), 857

S

- Salpingitis, acute initial, and appendicitis, differential diagnosis of, by means of a menstrual sign, (Ricci), 276
 - incidence of tubal pregnancy, (Van Etten), 645
- Salpingo-oophoritis, frequency of pregnancy in women who have had, (Holtz), 167 (Abst.)
- Sarcoma of the uterus, (Kasman), 767
- Science, natural, development of, (Graves), 341
 - unification of, and its relation to the control of life, (Graves), 341
- Secretions, endocervical, hydrogen-ion concentration of, (Meaker and Glaser), 167 (Abst.)
- Serum of syphilitic pregnant women, calcium-phosphorus ratio in, (Klauder and Brown), 60
- Sex characteristics, pathology of some special ovarian tumors and their relation to, (Meyer), 697
 - glands, female, influence of male sex hormone on, (Reiprich), 603 (Abst.)
 - hormones, clinical importance of, (Dodds), 520
 - life of twenty-two hundred women, factors in, (Davis), 325 (Book Review)
- Sexual cycle, immunologic aspects of, (Lyons and Van de Cour), 649 (Abst.)
- Society transactions, 119, 319, 445, 785, 928
- Sperm morphology in relation to fertility, (Moench and Holt), 199
- Spermatozoa count, (Macomber and Sanders), 168 (Abst.)
 - morphology of, (Moench and Holt), 203
- Spleen in eclampsia, (Acosta-Sison), 40
- Stearns, John, and pulvis parturiens, (Thoms), 418
- Sterility, 167 (Abst.)
 - artificial fecundation, (Vignes), 171 (Abst.)
 - classification of, (Mazer and Andrusier), 49
 - diagnosis and treatment of, (Graff), 169 (Abst.); (Giles), 169 (Abst.)
 - functional, incidence, diagnosis and treatment of, (Mazer and Andrusier), 46
 - treatment of, (Mazer and Andrusier), 54
 - in male, diagnosis and treatment of, (Walker), 170 (Abst.)
 - literature of 1930 on, (Schochet and Lackner), 491
 - relative, fundamental nature of, (Meaker), 167 (Abst.)
 - spermatozoa count in, (Macomber and Sanders), 168 (Abst.)
 - treatment of, by tubal insufflation, (Mayer), 170 (Abst.)
 - tubal insufflation in, results of, (Willbrand), 170 (Abst.)

Sterilization, hormonal, of female organism, (Hamberlandt), 512 (Abst.)
 temporary, of female animals by feeding insulin, (Vogt), 649 (Abst.)
 problem in Scandinavia, (Forssner), 171 (Abst.)
 tubal, through the uterine cavity, (Nishizaki), 171 (Abst.)
 Surgery, textbook of, (Homans), 475 (Book Review)
 Sympathectomy of the hypogastric artery, effects of, on female internal genitalia, (Chianello), 881
 Syphilis and pregnancy, (Adair), 468
 Syphilitic pregnant women, calcium-phosphorus ratio in serum of, (Klauder and Brown), 60

T

Teeth during pregnancy, (Adair), 463
 Teratoma of ovary, large, first noted eight years after menopause, (Meagher), 454
 Tetanoid syndrome in pregnancy, (Hartley), 665 (Abst.)
 Thyroid and headache at menopause, (Stevens), 655 (Abst.)
 diathermy of, on essential metrorrhagias, research studies and clinical results on, (Paroli), 655 (Abst.)
 folliculine and, (Gilardino), 654 (Abst.)
 function in so-called essential metrorrhagias, (Arbuzese), 654 (Abst.)
 functional status of, in pathogenesis of abortion, (Abruzzese), 655 (Abst.)
 hypofunction, (Mazer and Andrussier), 51
 Thyrotoxicosis complicated by pregnancy, (Fleischer), 273
 ✓ Toxemia of pregnancy, (Adair), 468
 literature of 1930 on, (Greenhill), 147
 relation of, to fetal mortality, (Grier), 892
 x-ray and radium, (Corscaden), 75
 Transplantation of ureter into sigmoid in patient whose other kidney was functionless, (Pierce), 438
 Transuterine insufflation, Baldwin modification of Jarcho pressometer for, (Baldwin), 783
 Trichomonas vaginalis, culture, incidence and treatment of, (Cornell, et al.), 360
 (Donne), preliminary study, (Stein and Cope), 368
 Tubal insufflation in sterility, results of, (Willbrandt), 170 (Abst.)
 treatment of sterility by, (Mayer), 170
 origin of endometriosis, (Everett), 1
 pregnancy, incidence of salpingitis in, (Van Etten), 645
 sterilization through the uterine cavity, (Nishizaki), 171 (Abst.)
 Tube, experimental lesions of, process of healing, (Volpe), 254 (Abst.)
 literature of 1930 on, (Schochet and Lackner), 492
 tumors of, study of, (Conill), 296 (Abst.)
 Tuberculosis of corpus uteri without involvement of endometrium, (Brown), 255
 Tumor, changes in, following radiotherapy, (Corscaden), 78
 granulosa cell, (Meyer), 700
 Krukenberg, (Greenhill), 445
 of reproductive organs, (Corscaden), 84
 of tube, study of, (Conill), 296 (Abst.)

Tumor, Cont'd

ovarian, pathology of some special, and their relation to sex characteristics, (Meyer), 697

U

Umbilical cord, hernia of, congenital, with eventration and absence of a sac, (Krumm), 442
 Umbilicus, endometriosis of the, (Thompson), 917
 University Woman's Clinic, functions of, (Stander), 376
 Urca content of the placenta, (Wehefritz and Gierhake), 399 (Abst.)
 Uremia, fatal, due to complete prolapse of the uterus, (Frank), 270
 Ureter, transplantation of, into sigmoid in patient whose other kidney was functionless, (Pierce), 438
 Urethra and vesical sphincter, reconstruction of, employing the levator ani muscles, (Douglass), 739
 internal diathermy, (Gellhorn), 301
 Urinary bladder in eclampsia, (Acostasison), 41
 protein in eclampsia, nature of, (Eastman), 756
 tract infections during pregnancy, (Morris and Langlois), 211
 Uterine abnormalities, relation of, to fetal mortality, (Grier), 893
 bleeding, functional, anterior pituitary luteinizing substance in treatment of, (Novak and Hurd), 501
 cavity, bacterial content of, in pregnant and nonpregnant women, studies on, (Gundel and Oettingen), 755 (Abst.)
 mucosa, elimination of dyes by the, (Meyer), 825 (Abst.)
 regeneration of, after delivery, (Williams), 664
 musculature, dependence of, upon function of ovary, (Siegmund), 657 (Abst.)
 Uteroovarian modifications in experimental hyperthyroidism, researches on, (Scibelli), 654 (Abst.)
 Uterosalingostomy, Baldwin modification of Jarcho pressometer for, (Baldwin), 783
 Uterus, abscess of, (Tommaselli), 280 (Abst.)
 acute puerperal inversion of, treated by abdominal replacement, (Irving and Kellogg), 440
 adenomyoma of, (Holden), 799
 and adnexa, alkali necrosis of, after injection of a soap solution into the, (Bickenbach), 738 (Abst.)
 benign conditions of, radiotherapeutic treatment of, anatomic changes subsequent to, (Corscaden), 74
 carcinoma of, radiotherapy of, (Corscaden), 80
 chorionepithelioma, perforating, of the, with free intraperitoneal hemorrhage, (Anspach and Hoffman), 239
 experimental lesions of, process of healing of, (Volpe), 254 (Abst.)
 fibroma of, and hypophysis, (Scaglione), 656 (Abst.)
 inversion of, acute puerperal, treated by abdominal replacement, (Irving and Kellogg), 440
 leiomyosarcoma of the, (Meaker), 400
 literature of 1930 on, (Schochet and Lackner), 480
 monkey, at term, contractions of, (Ivy, et al.), 388
 position of, based on study of spinal-pelvic relationship, (Magid), 281

Uterus, Cont'd

- prolapse of, complete, fatal uremia due to, (Frank), 270
- reduction in size of, following radiotherapy, (Corscaden), 79
- sarcoma of, (Kasman), 767
- spontaneous rupture of, following a wedge-shaped resection of the fundal portion, (Rosenfeld), 436

V

- Vagina, Elliott treatment, (Holden and Gurnee), 87
- epithelioma, primary, of the, (Moench), 837
- internal diathermy, (Gellhorn), 299
- new method of applying heat to (Elliott treatment), (Holden and Gurnee), 87
- Vaginal discharge, treatment of, (Adler), 238 (Abst.)
- hernia, posterior, treatment of, (Crousse), 224 (Abst.)

Vaginal, Cont'd

- speculum for cauterization of the cervix, (Lifvendahl), 444
- Varicose veins during pregnancy, (Adair), 466
- Version, relation of, to fetal mortality, (Grier), 896
- Vertex occipitoposterior position, treatment of, (Bill), 615
- Vitamin E of fertility, (Rio), 167 (Abst.)

W

- Weight during pregnancy, (Adair), 462
- infant's birth, relationship between mother's gain during pregnancy and, (Toombs), 851
- Williams, John Whitridge, In Memoriam, 661

X

- X-ray treatment in functional sterility, (Mazer and Andrussier), 55

